

## ACTIVITY TYPE TABLES

The following codes are used in the lists: AT = Activity Type; AC = Activity Component

### Activity Type: Access and Equipment Maintenance

General Activity	Activity Component	Work Element
Access and Equipment Maintenance	Access to work site	Access by foot or pack animals Access by vehicle on roads, within normal use patterns Access by vehicle or ATV off roads or outside of normal use patterns Access by helicopter/aircraft
	Fueling/Maintenance	Fueling/maintenance of light equipment on site Fueling/maintenance of heavy equipment on site

## Activity Type: Reforestation

See **Access and Equipment Maintenance Activity Type** for access and fueling issues; **Range Infrastructure Activity Type** for fencing; **Prescribed Fire Activity Type** for site preparation, fire and fuels reduction; **Roads and Road Maintenance Activity Type** for road work.

Activity Type	Activity Component	Work Element
Reforestation	Access for reforestation activities	Opening closed roads, including snowplowing <b>See Access and Equipment Maintenance AT;</b> For opening closed roads - <b>See Roads and Road Maintenance AT</b>
	Animal Damage Control	For fencing - <b>See Range Infrastructure AT</b> Chemical application, above and below ground Netting and associated devices for protection Use of snap traps for animal removal All except where otherwise noted
	Artificial Shade	Use of shade cards
	Aspen regeneration/protection- fencing	<b>See Access and Equipment Maintenance AT</b> For fencing – <b>See Range Infrastructure AT</b>
	Camping	For camping of crews - <b>See Prescribed Fire AT</b>
	Collection of Plant Propagation Materials	Climb to access or mechanically pick cones Fire arm use Pollen, scion material Collection of seeds or other vegetative material Tree felling to access cones - <b>See Mechanical Treatment AT</b> All except where otherwise noted
	Cone Collection/Genetics	<b>See Access and Equipment Maintenance AT;</b> <b>See Activity Component #6 of this component</b>
	Fuels reduction	Burning slashed material, including broadcast burning <b>See Prescribed Fire AT</b>
	Hand plant upland/riparian	Plant trees and shrubs with hoe, bar, auger; <b>See Access and Equipment Management AT</b>
	Natural Regeneration Surveys	<b>See Access and Equipment Maintenance AT</b>
	On-site tree storage	Building and maintaining snow cache
	Pre-Activity Surveys	<b>See Access and Equipment Maintenance AT</b>
	Return visits after planting	<b>See Access and Equipment Maintenance AT</b> All except where otherwise noted
	Seed Production Development	Commercial thin to remove undesirable trees, cone crop enhancement – <b>See Mechanical Treatment AT – Work Element – understory/single story treatments: thinning</b>

## Activity Type: Reforestation (cont.)

	Treat slash mechanically or by hand - <b>See Mechanical Treatment AT – Activity Component – Rehab, removal of excess vegetation and slash</b> All except where otherwise noted
Site preparation	For Prescribed burn - <b>See Prescribed Fire AT</b>
<b>See Mechanical Treatment AT; Rehab, removal of excess vegetation and slash</b>	Mechanical scarification with D3 and rake, salmon blade, etc. Hand scalp Hand mechanized scarifier Spot application of herbicides - <b>See Weeds/Chemical Treatment AT –Herbicide Control Activity Component</b> All except where otherwise noted
All activity components except where otherwise noted	All except where otherwise noted

## Activity Type: Trails and Trail Maintenance

### See Mechanical Treatments AT (Tree Falling); Access and Equipment Maintenance

Activity Type	Activity Component	Work Element
Trails & Trail Maintenance	Construction/Reconstruction/ Heavy Maintenance	<p>For tree felling - <b>See Mechanical Treatment AT</b></p> <p>Horses / Weed free hay</p> <p>Camping</p> <p>Trail decommissioning</p> <p>Ford Maintenance/construction <b>Also refer to Watershed Restoration AT – In Channel Erosion Control</b></p> <p>Gravel borrowing/borrow pit</p> <p>Reseeding edges/banks - <b>See Watershed Restoration AT - Revegetation</b></p> <p>Tread construction</p> <p>Bridge building</p> <p>Trail relocation away from meadows</p> <p>Puncheon/ turnpike construction</p> <p>Culvert installation</p> <p>Blasting - surface, subsurface and aerial</p> <p>Major tread reconstruction (blowout repair, large cribbing projects)</p> <p>All except where otherwise noted</p>
	Light Maintenance	<p>For hazard tree removal - <b>See Mechanical Treatment AT</b></p> <p>Installation, clean out, and repair of drainage features (waterbars, dips, etc)</p> <p>Signing (blazes, rock cairns, sign posts)</p> <p>Repair of structures near water (bridges, stream, fords)</p> <p>Repair of land structures (puncheons, turnpike, steps)</p> <p>Minor tread reconstruction</p> <p>Non mechanical log clearing and brushing</p> <p>Mechanical log clearing and brushing</p> <p>Excavating material near water (gravel bar)</p> <p>Excavating material (borrow pits, trenches)</p> <p>Debris removal (slough, rocks, roots)</p> <p>All except where otherwise noted</p>
	All activity components except where otherwise noted	All except where otherwise noted

## Activity Type: Roads and Road Maintenance

Activity Type	Activity Component	Work Element
Roads & Road Maintenance	Decommissioning Roads	For re-vegetation – <b>Also see Range Infrastructure and Reforestation AT</b> Re-contouring Water barring Roadbed ripping Culvert removal Berm construction Side cast pullback All except where otherwise noted
	Road Maintenance	Traffic Control Blading and grating Disposal site use Hazard tree removal - <b>See Mechanical Treatment AT</b> Adding cross drain culverts Bridge maintenance - riprap, deck cleaning, guardrail repair, abutment repair Dust abatement - water or chemical Surface rocking (rock replacement) Slide removal Roadside brushing Opening closed roads, including logging out; snow plowing - <b>See Reforestation AT</b> Logging out - <b>See Mechanical Treatment AT</b> Ditch cleanout Culvert maintenance All except where otherwise noted
	Road Restoration	Stormproofing Bridge replacement Installation of drainage dips and waterbars Culvert installation and upgrade Surface shaping and draining Surface material processing - in place rock crushing All except where otherwise noted
	New Construction / Reconstruction	Vegetation clearing - pioneering activities Installation of drainage features/includes bridge construction Earthwork Finish Surfacing All except where otherwise noted
	All activity components except where otherwise noted	All except where otherwise noted

## Activity Type: Range Infrastructure

See **Weeds and Chemical Treatment Activity Type** for weeds; **Prescribed Fire Activity Type** for fire and camps; **Access and Equipment Maintenance** for transportation

Activity Type	Activity Component	Work Element
Range Infrastructure	Fence Construction, Reconstruction and Maintenance	Stringing wire Digging post holes (manual/mechanical) Clearing right of way Building rock jacks Onsite material cutting, gathering rocks, etc Pre-project weed control - <b>See Weed/Chemical Treatments AT</b> Spike / work camps - <b>See Prescribed Fire AT</b> All except where otherwise noted
	Rangeland Restoration	Aerial seeding Seeding - disking, drilling, fertilizing, plowing Chaining Prescribed fire - <b>See Prescribed Fire AT</b> All except where otherwise noted
	Water Development Construction, Reconstruction ( <b>springs, guzzlers, tanks, ponds, reservoirs, wells</b> )	Rock haul / material haul Earthwork (cat, dragline, scraper) Pipelines – trenching All water developments - Clearing All water developments - Transporting materials All water developments - Installing troughs, storage tanks or pits All water developments - Installing/building fence around development <b>See Fence Construction AC</b> All water developments - constructing apron - rubber, metal, asphalt All except where otherwise noted
	All activity components except where otherwise noted	All except where otherwise noted

## Activity Type: Prescribed Fire

### See Roads and Road Maintenance Activity Type for road opening/closing

Activity Type	Activity Component	Work Element
Prescribed Fire	Fire Support	<b>See Roads and Road Maintenance AT</b> Fire/spike camp All except where otherwise noted
	Fireline Construction / Holding Actions	Machine built fireline “Wet” line/foam line Pumping from streams/ponds using portable pumps Drafting to fill engines/tenders Natural barriers, riparian and wetlands Machine built fireline Helicopter dipping Hand built fireline Explosive built fireline “Black” line All except where otherwise noted
	Helicopter Landing Sites and other Operational Facilities	Helicopter support sites; refuel, alumigel mix sites, etc.
	Ignition	Hand ignition Mechanized ignition Aerial ignition All except where otherwise noted
	Mop-up	Engine Hand tool Hose lays All except where otherwise noted
	All activity components except where otherwise noted	All except where otherwise noted

See “Example Appendix” for the criteria developed by the salmonid group for this component

#### Burn Prescription

#### Prescribed fire design and implementation

## Activity Type: Defensible Space

Activity Type	Activity Component	Work Element
Defensible Space	Fuels reduction	Remove plants or plant parts Replace flammable plants with less flammable plants All except where otherwise noted
	Structure modifications	Replace flammable roof materials Remove ignitable materials surrounding structure All except where otherwise noted
	All activity components except where otherwise noted	All except where otherwise noted



## Activity Type: Abandoned Mine Restoration

See **Roads and Road Maintenance Activity Type** for road decommissioning. See **Access and Equipment Maintenance**

Activity Type	Activity Component	Work Element
Abandoned Mine Restoration	Mining Waste Cleanup	Removal action - Junk removal ( <b>See also Hazmat below</b> ) Preliminary assessments, inventories, analyses Contaminated soil removal Site investigation - Chemical sampling Barrel removal Reclamation plan implementation All except where otherwise noted
	Mine Site /Abandoned Mine Reclamation	<b>See Roads and Road Maintenance Activity Type</b> Restore surface flow Floodplain reclamation Mine shaft backfilling Removal of hazardous waste (hazmat) Close mine openings/adits/stopes - gates Close mine openings/adits/stopes - foam sealant Close mine openings/adits/stopes – backfilling Close mine openings/adits/stopes - blasting Wetlands reclamation - remove contaminated soil Wetlands reclamation - restore stream channel Wetlands reclamation - construct cell Tailings impoundment rehab - water management Tailings impoundment rehab - cap impoundment Dredge tailings restoration - aerial videography Dredge tailings restoration - tailings redistribution Dredge tailings restoration - restore channel flow Groundwater control - reroute Groundwater control - treat Groundwater control - Test Mine waste dump removal - Treat Mine waste dump removal - Test Mine waste dump removal - Inventory and monitor Mine waste dump removal – Re-vegetation - <b>See Range</b> <b>Infrastructure Activity Type – Rangeland Restoration</b> All except where otherwise noted
	All activity components except where otherwise noted	All except where otherwise noted

## Activity Type: Insect Suppression

See **Mechanical Treatments Activity Type** for felling, thinning, and hazard trees; **Roads and Road Maintenance Activity Type** for snowplowing; **Prescribed Fire Activity Type** for fire, **Reforestation Activity Type** for planting; See **Access and Equipment Maintenance Activity Type**

Activity Type	Activity Component	Work Element
Insect Suppression	Aerial survey and application of insecticides and pesticides	Fixed wing/helicopter flights and application below 1500 foot altitude
		Fixed wing /helicopter flights and application above 1500 foot altitude
		All except where otherwise noted
	Fertilization	Hand application of N frells All except where otherwise noted
	Ground application of pesticides	Back-pack spraying or inoculation of individual trees with insecticide
		Borax treatment of freshly cut stumps
		All except where otherwise noted
	Ground Survey	Walking survey - <b>See Access and Equipment Maintenance Activity Type</b>
	Manual Treatments	Thin, selecting against species/conditions - <b>See Mechanical Treatment AT – Understory/single Story treatments: thinning</b>
		Burning infested tree
		Topping or otherwise killing, and removing infested trees
		Slash disposal lop and scatter pile or cover hand pile and burn - <b>See Mechanical Treatment AT – Rehab, removal of excess vegetation and slash</b>
		Pruning All except where otherwise noted
	Mechanical Treatments	Slash disposal debark/chip/or fragment, machine pile and burn - <b>See Mechanical Treatment AT – Rehab, removal of excess vegetation and slash</b>
		Young stand destruction, chaining, roller-chopping
		Overstory removal - <b>See Mechanical Treatment AT, Overstory treatments: overstory removal, partial overstory removal, sanitation</b>
		Harvest/removal of fire-damaged or other high-risk trees
		Thin, selecting against species/conditions - <b>See Mechanical Treatment AT – Harvest Prescriptions Implementation</b>
		All except where otherwise noted
	Plant less-susceptible species	<b>See Reforestation AT</b>
	Population assessment and trapping	<b>See Roads and Road Maintenance AT</b>
		Sampling and trapping All except where otherwise noted
	Use of Fire	<b>See Prescribed Fire AT</b> Pulling back duff from legacy trees

## Activity Type: Insect Suppression (cont.)

Use of Pheromones

Anti-aggregate bubble caps

Trap tree baiting and removal

All activity components except  
where otherwise noted

All except where otherwise noted

## Activity Type: Forest Products

Activity Type	Activity Component	Work Element
Forest Products	Firewood collection	Collect firewood from already downed sources (e.g. hazard tree removal, road maintenance, etc.) - <b>See Access AT; Roads and Road Maintenance AT</b>
	Fruits, berries and nut harvest	Hand picking and raking of edible berries
	Greenery harvest – total removal	Digging of species for complete removal
	Moss harvesting	Moss removal
	Mushroom harvesting	Removal of fungi Raking of soil substrate/mycelium All except where otherwise noted
	Seed collection <b>See AC - Collection of Plant Propagation Material</b>	Collection of cones by climbing, tree falling, or shooting Collection from plants All except where otherwise noted
	Tree and shrub removal	Complete or partial removal of trees or shrubs - <b>See Mechanical Treatment AT</b>
	Public Access	Public access - <b>See Access and Equipment Maintenance AT</b>
	All activity components except where otherwise noted	All except where otherwise noted

## Activity Type: Recreation Facilities and Operations

See **Range Infrastructure Activity Type** for water development; **Access and Equipment Maintenance Activity Type**

Activity Type	Activity Component	Work Element
Recreation Facilities And Operations	Existing Facilities Developed and Dispersed	Install site furniture Remove trees and ground vegetation, blade to create smooth surface, apply gravel, asphalt or concrete to harden site All except where otherwise noted
	Install /Remove toilets	Harden entry to building Remove trees, excavate, construct building Collapse building into vaults or haul structures off-site All except where otherwise noted
	Installation of other site amenities	Remove trees and vegetation, excavate, backfill All except where otherwise noted
	Obliteration/Rehabilitation of recreation sites	Remove any existing site furniture Install barriers (boulders, fencing, signs, etc.) Rip surface, re-contour, topsoil, seed, mulch All except where otherwise noted
	Recreation Site Maintenance	Road grating, spot graveling
	Water development	Excavate hole, pump installation Trenching for distribution line All except where otherwise noted
	All activity components except where otherwise noted	All except where otherwise noted

## Activity Type: Mechanical Treatment

See **Roads and Road Maintenance Activity Type** for snow removal, opening closed roads, road work; **Access and Equipment Maintenance** for access and refueling; **Prescribed Fire Activity Type** for fire; **Weeds/Chemical Treatment Activity Type** for weed prevention actions

Activity Type	Activity Component	Work Element
Mechanical Treatment	Access	<b>See Access and Equipment Maintenance AT and Weeds/Chemical Treatment AT</b>
	Dust Abatement	Chemical palliatives - <b>See Roads and Road Maintenance AT</b> Water drafting - <b>See Prescribed Fire AT</b> All except where otherwise noted
	Harvest Prescriptions / Implementation	Regeneration harvest: clear-cut, seed tree, shelterwood Understory/single story treatments: thinning Overstory treatments: overstory removal, partial overstory removal, sanitation Dead trees: salvage, hazard tree removal Selection - all stand layers All except where otherwise noted
	Skidding/Yarding, Hauling, Loading	Skidding/yarding Hauling All except where otherwise noted
	Killing Submerchantable Trees	<b>See AC – Felling (below); Prescribed Fire AT</b>
	Landings and Skid Trails	Construction and location
	Logging Systems	Ground based Helicopter High lead Skyline All except where otherwise noted
	Piling of Tops	At landing Within unit All except where otherwise noted
	Reducing Soil Compaction	Subsoiling
	Refueling	<b>See Access and Equipment Maintenance AT</b>
	Rehab, removal of excess vegetation and slash	Furrowing Patch scarification, mechanically or by hand Dozer scarification Dozer piling Grapple piling Hand piling All except where otherwise noted
	Road Construction	<b>See Roads and Road Maintenance AT</b>
	Road Maintenance	<b>See Roads and Road Maintenance AT</b>
	Skid Trail/Landing Rehab	Waterbars

**Activity Type: Mechanical Treatment (cont.)**

Tree Felling

Hand

Mechanical

All except where otherwise noted

All activity components except  
where otherwise noted

All except where otherwise noted

## Activity Type: Watershed Restoration

See **Roads and Road Maintenance Activity Type** for obliteration; **Access and Equipment Maintenance Activity Type**

Activity Type	Activity Component	Work Element
Watershed Restoration	Hillslope Erosion Control	Gully check structures: install straw bales, logs, silt fences Trenching Terracing Slope ripping, sub-soiling <b>See Mechanical Treatment AT</b> Gully check structures Erosion control mulch or blankets Contour felling Road/landing ripping Install wattles All except where otherwise noted
	In-Channel Erosion Control	Log, root wad, or willow bundle revetments Reshape stream banks and incised channels Lay back vertical banks Install barbs Structural bank controls (riprap, etc) All except where otherwise noted
	Revegetation	Seeding - aerial or hand application - <b>See Range Infrastructure AT - Rangeland restoration</b> Site prep - surface scarification, tilling, ripping - <b>See Reforestation AT – Site preparation</b> Planting , upland and riparian - grass, forb, shrub, tree – <b>See Reforestation AT – Hand plant upland / riparian</b> Mulch application Hanson dibble All except where otherwise noted
	Road Obliteration	<b>See Roads and Road Maintenance AT</b>
	Sediment Control	Maintain instream basin Construct instream basin (impoundment) Instream log structure All except where otherwise noted
	Watershed Monitoring	Establish/monitor erosion plots Install gage Instream water/sediment collection Manual instream measurements Monument plots All except where otherwise noted
	All activity components except where otherwise noted	All except where otherwise noted



## Activity Type: TES Habitat Restoration

See **Range Infrastructure AT** for fencing, water source/spring construction, and reseedling; **Roads and Road Maintenance AT** for decommissioning and obliteration; **Prescribed Fire AT**; **Mechanical Treatments AT** for tree removal, **Trails and Trail Maintenance AT** for trail construction, **Reforestation AT** for seed collection; **Access and Equipment Maintenance AT**

Activity Type	Activity Component	Work Element
TES Habitat Restoration	Instream Restoration	Helicopter operations - <b>See Prescribed Fire AT</b> Hilti drill operation Mulching for erosion control - <b>See Watershed Restoration AT - Mulch application</b> Placement of boulders or large woody material - <b>See Watershed Restoration AT – Install barbs; structural bank Controls (riprap, etc.)</b> Power saw operation Seeding for erosion control - <b>See Range Infrastructure AT</b> All except where otherwise noted
	Meadow Restoration	Fence construction <b>See Range Infrastructure AT</b> Mowing All except where otherwise noted
	Prescribed Fire	<b>See Prescribed Fire AT</b>
	Riparian Improvement	Native plant seeding - <b>See Range Infrastructure AT</b> Non-native plant seeding - <b>See Range Infrastructure AT</b> Placement of small trees, shrubs, seedlings All except where otherwise noted
	Snag Creation	Tree climbing - <b>See Reforestation AT – Collection of plant propagation materials</b> Inoculation - <b>See Insect Suppression AT</b> Girdling trees Tree topping - <b>See Insect Suppression AT – Topping or otherwise killing, and removing infested trees</b> All except where otherwise noted
	Brush Pile Construction	Mechanical equipment / heavy machinery - <b>See Access and Equipment Maintenance AT</b> Tree felling (power saw) - <b>See Mechanical Treatment AT</b> Tree felling (hand tools) - <b>See Mechanical Treatment AT</b> All except where otherwise noted
	Contour Felling	Contour felling - <b>See Mechanical Treatment AT</b>
	Exclosure Construction and Maintenance	Light mechanical tool operation - <b>See Access and Equipment Maintenance AT</b> Power tools - <b>See Access and Equipment Maintenance AT</b> All except where otherwise noted
	Fish population Recovery / Enhancement	Fish barrier installation or removal Exotic species removal-trapping Exotic species removal-rotenone All except where otherwise noted

## Activity Type: TES Habitat Restoration (cont.)

Interpretation/Conservation Education	Signing Viewpoint Construction - <b>See Recreation Facilities &amp; Operations AT – Existing facilities developed and dispersed</b> Trail access / building - <b>See Access and Equipment Maintenance AT; Trails and Trail Maintenance AT</b> All except where otherwise noted
Monitoring Fish and Wildlife	Fish snorkeling or underwater video Channel condition survey, fish habitat inventory Use of snowmobiles - <b>See Access and Equipment Maintenance AT</b> Wildlife and fish telemetry Wildlife denning/nesting surveys Direct wildlife observation Aerial wildlife counts Redd counts Fish electroshocking All except where otherwise noted
Quarry Restoration	Waste storage Seeding - <b>See Range Infrastructure AT</b>
Road decommissioning	<b>See Roads and Road Maintenance AT</b>
Road obliteration	<b>See Roads and Road Maintenance AT</b>
Spring Restoration and repair	<b>See Range Infrastructure AT</b>
Thinning	<b>See Mechanical Treatments AT</b>
Water Source Construction	<b>See Range Infrastructure AT</b>
Aspen Restoration	Mechanical root shearing Prescribed fire - <b>See Prescribed Fire AT</b> All except where otherwise noted
All activity components except where otherwise noted	All except where otherwise noted

## Activity Type: Weeds/Chemical Treatments

See also **Prescribed Fire Activity Type** for fire; **Access and Equipment Maintenance AT**

Activity Type	Activity Component	Work Element
Weeds/Chemical Treatments	Biological control	Collection / release of insects or other biological controls Monitoring by sweep netting Competitive seeding Transport of bio-control agent by vehicle All except where otherwise noted
	Cultural Control	Provide shade - <b>See also Reforestation AT – Artificial shade</b> Fertilize—by hand, machine, or aerial - <b>See Insect Suppression AT - Fertilization</b> Injection/cut stump Chaining - <b>See Reforestation AT – Site preparation</b> Grubbing - <b>See Reforestation AT – Site preparation</b> Prescribed fire - <b>See Prescribed Fire AT</b> Use Grazing to control weeds, fencing or herding Plant native vegetation - <b>See Watershed Restoration AT - Revegetation</b> On and off road vehicle use - <b>See Access and Equipment Maintenance AT</b> Mulch—by hand of machine - <b>See Watershed Restoration AT - Revegetation</b> All except where otherwise noted
	Herbicide Control <b>See Insect Suppression AT</b>	Hand crank granular spreader Liquid application Spray from ATV Granular application Back pack sprayer with spray wand Aerial application by fixed wing or helicopter Spray from truck mounted boom or spray Hand controlled wand with soaked wick All except where otherwise noted
	Manual Control	Hand clip seed heads or pull weeds
	Mechanical Control/Restoration	Weed-whacker use Plowing—transport of heavy equipment Mowing of weeds - <b>See Habitat Restoration AT – Meadow restoration</b> Drill seeding Aerial application of seed - <b>See Insect Suppression AT – Aerial survey and application of insecticides and pesticides</b> All except where otherwise noted
	Weed prevention	Wash vehicles, water drafting
	Information	Education/outreach
	All activity components except where otherwise noted	All except where otherwise noted

## INTRODUCTION

Fifteen Activity Types are described in the following narratives. Fourteen of these (all but Access and Equipment Maintenance) are listed and defined in the National Fire Plan. The Technical Team created the Access and Equipment Maintenance Activity Type to address an activity that is common throughout the other fourteen activities. Not all of the activities described through the National Fire Plan are addressed here, however, there are plans to add these in the near future.

These narratives are designed to provide background information and relatively brief but informative descriptions of Activity Types, Activity Components, and the Work Elements. The level of detail and description of the activity and work element varies. The user may desire or need additional information to complete an assessment, or to fully understand a work component or element. In those cases, we highly recommend and encourage the user to seek additional information from their local agency specialist or agency materials. Agency handbooks, manuals, and other guides are available for the user to refer to when more information is needed.

The Activity Types are listed in **Bold** print, following the **red** type. The Activity Components are also bolded, and follow the Activity Type. Work Elements are italicized. Each of these correspond with the Activity Tables.

### **ACTIVITY TYPE: Access and Equipment Maintenance**

## ACTIVITY COMPONENTS AND WORK ELEMENTS

### **Access to Work Sites**

All activity types require some form of access to the work site and travel within the site. Access refers to mobilizing work crews, and the delivery and hauling of equipment, materials, and supplies needed to carry out the activity components and their associated work elements.

*Access by Foot or Pack Animal* - Access and mobilization to reach and maneuver around the work site would be accomplished on foot, or with pack animals (e.g., horses, mules, llamas and even goats). Pack animals or travel by foot may be needed to access areas that cannot physically be accessed by a road system or by mechanized vehicles. These areas may include but are not limited to, wilderness and roadless areas, areas with seasonal or year round access restrictions (i.e. wildlife concerns), or watersheds with erosive or unstable soils. Roads often have seasonal closures to protect lambing and calving, or during wet periods when roads are subject to damage by erosion. Pack animals and travel by foot can only be used, however, when the work activity does not require the use of heavy equipment or large quantities of material (i.e. fencing supplies, gravel, soil, or large structures).

*Access by Vehicle on Roads within Normal Use Patterns* – Access by vehicles within normal use patterns may include travel with passenger vehicles (for crews), all terrain vehicles, large and small sized trucks, trucks hauling heavy machinery, logs, or other materials that require the use of a dump truck (e.g., soil, gravel, poles, or any number of other supplies). Vehicular use on system roads and designated off road areas would generate expected and more predictable levels

of disturbance, or risk to other resources.

*Access by Vehicle or ATV Off Roads or Outside of Normal Use Patterns* – All of the mechanized vehicles mentioned above may be used under this activity as well. The frequency, duration and level of disturbance generated from mechanized vehicle, heavy equipment and power tools outside of what is considered normal, may cause erratic, continuous, or higher levels of disturbance and increased damage to certain resources. For example, travel off-roads and onto undesignated trails or areas with no trails, may alter normal wildlife use patterns, increase soil erosion and compaction in susceptible areas, (wet meadows, streams, or sensitive plant communities), or spread weeds into previously unoccupied areas.

Work activities during fire suppression, prescribed fire, or any other work activity related to rehabilitation may need to occur outside of normal use patterns. In some cases, post fire salvage efforts may require access and associated road or off road use for long periods of time, may require higher numbers of log hauling trucks, larger crews, or road maintenance (e.g., grading and dust management), at high frequency intervals.

Rangeland rehabilitation efforts may require off-road access, larger crews and the hauling of materials to rebuild fences or water developments.

*Access by Helicopter / Aircraft* – Some work sites or distribution points may need to be accessed by helicopter for transporting crews, aircraft equipment, materials and supplies. Aerial access may occur for any number of reasons including but not limited to emergency situations and the immediacy of work needed, or the site location relative to roads or trails.

### **Fueling/Maintenance**

Vehicles used to travel to worksites, and heavy equipment and power tools used at worksites may need re-fueling and maintenance throughout the duration of the work activities. It is not always practical or possible to re-fuel and conduct maintenance at a development such as a warehouse.

*Fueling/maintenance of Light Equipment on Site* - Chain saws, augers, and other lighter power tools can be refueled and serviced at the site with little to no risk to other resources.

*Fueling/maintenance of Heavy Equipment on Site* – Bulldozers, graders, backhoes and other heavy machinery and equipment will need re-fueling and maintenance during work activities, and it may not always be practical to do this at a development such as a warehouse. Heavy equipment may require the use of high volumes of fuel, and repair and maintenance may be frequent. The risk of spilling substantial amounts of fuel, or cleaning substances and/or accidental release of other toxic substances may increase.

Normally, a site is designated where these activities can safely occur. Sometimes it may not always be possible to reach these sites if equipment runs out of fuel or if equipment fails and needs immediate repair. In all circumstances certain habitats should be avoided including wetlands, streamside riparian areas and habitats with sensitive plants, to name a few.

### **ACTIVITY TYPE: Reforestation**

Reforestation activity components primarily address treatments needed to replant and seed forested habitats. Several of these activity components overlap with information provided under other activity types; these are identified below when applicable.

## **ACTIVITY COMPONENT AND WORK ELEMENTS**

### **Access for Reforestation Activities**

*Opening Closed Roads Including Snowplowing* - Access for reforestation activities (i.e. tree planting, surveys, animal protection) may result in repeat visits after initial planting. Motorized vehicle access (i.e. truck) is preferred, however, when vehicle travel is restricted or in unroaded areas, the transport of trees, equipment, and crews may be done with ATV's, foot, pack animal or helicopters depending on the travel plan regulations.

Snowplowing is commonly required to access spring planting units. Although snow caches are not common, when they are used, snow plowing to the cache area is required as early as January. Commonly, drifts are plowed and the road is allowed to dry before the crews access the units for planting. In very high snow areas, the majority of the snow is plowed leaving several inches to melt and the road to dry before vehicle use. Road maintenance practices to minimize sediment transport should be used.

See **Access and Equipment Maintenance** and **Roads and Road Maintenance Activity Types** for additional information.

**Animal Damage Control** - Chemicals, traps, netting and fencing may all be used to protect planted seedlings from animals.

*Chemical Application Above and Below Ground* - Direct gopher control includes baiting with rodenticides (generally strychnine treated grains); elk and deer damage control includes the

application of animal repellants such as Big Game Repellent (putrescent egg solids chemical) or similar commercially available chemicals to seedlings.

*Netting and Associated Devices for Protection* - Seedlings can be protected from some damage by slipping vexar tubing or netting over the seedling. Fencing is used to protect plantations from cattle although altered pasture systems are generally as effective and less costly. Fencing plantations to protect trees from big game is generally done only on high value plantations such as aspen clones. See the **Range Infrastructure Activity Type** for fence construction and reconstruction work elements.

*Use of Snap Traps for Animal Removal* – These traps kill the target species and may be placed in gopher runs or other areas where small rodents are threatening regeneration areas.

**Artificial Shade** - Artificial materials are used to protect planted seedlings from mid-day sun or high solarization, where there is inadequate natural shade, such as provided by stumps and logs.

*Use of Shade Cards* - For protection, artificial shade materials such as styrofoam cards or mesh shade cloth can be secured next to the seedlings with wire pins.

**Aspen Regeneration/Protection Fencing** - See **Access and Equipment Maintenance Activity Type** for access, and **Range Infrastructure Activity Type** for work elements associated with fencing.

**Camping** - Tree planting crews may camp near planting sites to reduce travel time. Site selection and maintenance of the camp (trash, clean-up, waste water) is controlled with the planting contract. Crews are generally not allowed in improved campgrounds or areas commonly used by the public. See the **Prescribed Fire Activity Type** for further details.

**Collection of Plant Propagation Materials** - Cone collection requires access to the upper third of the tree crown when the cones are ripe.

*Climb to Access or Mechanically Pick Cones* - Cones may be collected by mechanical means, or by climbing a tree to reach the tree crown. Climbing trees does not cause damage, although spurs should not be used on some species (western white pine). In level terrain, such as seed orchards, cherry pickers and other machines can be used to access the cones directly in the tree crown. Collection for most species begins in August although testing for cone ripeness occurs sooner.

*Fire Arm Use* - Branches may be shot off with guns when small amounts of material are needed.

*Pollen and Scion Material* - Material necessary for genetic work is collected as described for cone collection. Scions are tree branches brought to nurseries for sprouting or grafting to other trees. Cages are sometimes placed over cones attached to trees to protect them from damage or consumption by various wildlife species. For example, white bark pinecones are caged in some areas for protection from Clark's Nutcrackers.

*Collection of Seeds or other Vegetative Material* – Seeds and other vegetative material are collected for propagation from their native setting; most collection occurs by hand.

*Tree Felling to Access Cones* - Occasionally, trees are felled and cones picked directly from the crowns. These trees cannot be used for future cone collections and they may be sold in a small sale or left on the ground large woody debris. This may be done in timber sale units prior to harvest operations. See the **Mechanical Treatments Activity Type** for additional work elements associated with felling trees.

**Cone Collection/Genetics** - See the **Access and Equipment Maintenance Activity Type** and the activity component “Collection of Plant Propagation Materials” (above) for associated work elements.

## **Fuels Reduction**

*Burning Slashed Material, including Broadcast Burning* - See the **Prescribed Fire Activity Type** for associated activity components and work elements.

## **Hand Plant Upland/Riparian**

*Plant Trees and Shrubs with Hoe, Bar and Auger* - Tree planting occurs primarily in spring, and some summer and fall planting also occurs. Non-conifer trees and shrubs may be planted in conjunction with traditional conifer planting operations, or as a separate activity. Competing vegetation may be removed as part of the planting operation (refer to following Activity Component - Site Preparation). A hole is opened and a single seedling planted. For large planting programs, planting units may be concentrated in smaller geographic areas for logistical purposes. Crews range in size from 4 to 30 people depending on the size of the planting program. Hoe dads, augers, bars, and shovels are used to plant trees. The auger is the only mechanized tool. See the **Access and Equipment Maintenance Activity Type** for related work elements.

**Natural Regeneration Surveys** - Generally, on timber suitable lands or those harvested, surveys are conducted within one year of harvest or wildfire, and subsequently at years three and five. Survey intensity is dependent on the agency’s land management objectives. On unmanaged lands, an initial post fire assessment should be conducted to determine regeneration potential. Many forested areas naturally regenerate and periodic monitoring occurs to assure regeneration. See the **Access and Equipment Maintenance Activity Type** for related work elements.

**On Site Tree Storage** - In the absence of a cooler, tree storage may be necessary at or near the planting site, to prevent trees from breaking dormancy before planting. Road plowing may be necessary to access the site where the cache will be constructed and maintained. See **Access and Equipment Maintenance** and **Reforestation Activity Types** (above) for additional information.

*Building and Maintaining Snow Caches* - Although not a common practice, caches may be placed in isolated higher elevation areas to store seedlings for spring planting. Caches are built as early as January by pushing snow over a simple frame by a small bulldozer (D6) and allowed



to freeze in place. Structures may be covered with straw or sawdust to maintain snow. Boxes of tree seedlings are stored in the cache until needed for out planting. Access roads must be snowplowed for cache construction and maintenance.

**Pre-Activity Surveys** - See the **Access and Equipment Maintenance Activity Type** for details.

**Return Visits after Hand Planting** - Return visits are typically conducted to inventory, monitor and conduct maintenance activities in areas planted or naturally regenerating. Netting and shade cards are maintained at least annually. Maintenance generally involves a walk through the unit straightening or replacing shade cards knocked down or destroyed by animals, and/or re-installing netting and putting in new nets.

After tree planting, surveys are conducted after the first and third growing seasons, and sometimes during the fifth year as described for natural regeneration surveys. The entire acreage planted will be surveyed. See the **Access and Equipment Maintenance** for details.

**Seed Production Development** - Forested areas, from 5- 30 acres, are selected as seed tree production areas and are located where trees are phenotypically superior, and where cones and seeds will be collected over long time periods (10 + years).

*Commercial Thin to Remove Undesirable Tree, Cone Crop Enhancement* - To enhance the genetic quality of seed collected from certain stands, areas are typically commercially thinned and the material sold in commercial timber sales. See the **Mechanical Treatments Activity Type** for descriptions of the activity components and work elements associated with thinning. To enhance pollen and cone crop production, fertilizers are applied semi-annually. See **Weeds and Chemical Treatment Activity Type** for more information.

*Treat Slash Mechanically or by Hand* – After commercial thinning treatments, excess slash may be hand or dozer piled. Piles may be left, removed or burned. See the **Mechanical Treatments Activity Type** for descriptions of the activity components and work elements associated with slash treatments.

**Site Preparation** - Prior to planting or natural regeneration, site preparation is conducted to reduce fuels and competing vegetation, and further ensure seedling establishment and survival.

See the **Prescribed Fire Activity Type** for activity components and work elements needed to prepare a site for planting using fire. Fire removes the woody debris and herbaceous litter that interferes with seedbed preparation. The effectiveness of using fire to remove debris varies with environmental conditions and the amount and distribution of fuel.

In some cases, mechanical site preparation is done in conjunction with a timber sale or a separate activity. See the **Mechanical Treatments Activity Type** for related information.

*Mechanical Scarification with D3 and Rake, Salmon Blade* - Mechanical methods of site preparation include the use of a small bulldozer such as a D3 with a brush rake, salmon blade, or similar tool to remove plants, roots, and rip topsoil and sod, exposing mineral soil. Some machines are designed to scarify patches; other machines do more intensive soil disturbance.

Chaining is used to remove and/or destroy vegetation in areas with dense shrubs or small trees. For this procedure, a heavy chain is extended between two tractors; brush and other small trees are destroyed or pulled up as the tractors proceed through a treatment area. Chain-dikers have disks welded to the links of an anchor chain. This is pulled behind a crawler tractor and as the chain rotates it improves tillage, land smoothing and basin formation, in a single pass. This is the most effective method for preparing seedbeds on sites with relatively large amounts brush and other woody debris. Grubbing is done with a heavy hoe (a grubbing hoe), to remove plant roots.

*Hand Scalp* – Alternatives to machine scarification include hand scalping during tree planting operation. A hand scalper is used to prepare spots for planting. When sod is not heavy, vegetation may be scraped and removed from an area with a radius of up to 12 inches.

*Hand Mechanized Scarifier* – This is a brush blade with a head on it that rips the topsoil and sod at each planting area.

*Spot Application of Herbicides* - Spot applications of herbicides such as Pronone (hexazinone) or Roundup (glyphosate) may also be used. Pronone is a granular herbicide that is applied with a hand applicator around already planted trees. Glyphosate is applied in a 2.5 - 3 foot radius circle around a protected seedling. See the **Weeds/Chemical Treatment Activity Type** for additional activity components and work elements used to apply herbicides.

## **ACTIVITY TYPE: Trails and Trail Maintenance**

### **ACTIVITY COMPONENTS AND WORK ELEMENTS**

**Construction/Reconstruction/Heavy Maintenance** - Trail construction could involve a number of work activities and elements depending on the type of trail needed to meet the recreation objective and constraints involving soils, terrain, and other resource concerns. Trail development could range from merely mowing the trail, to the use of a trail builder machine (trail dozer) and compacter. Construction activities typically include clearing and grubbing, trailbed excavation and building turnpikes, puncheons and switchbacks. Structures such as bridges and rock retaining walls may be constructed, and depending on the site's drainage abilities, the work may require the installation of water bars, grade dips, and/or culverts.

Trail reconstruction could require the use of power and/or hand tools as well as heavy equipment. The most common reconstruction activities include adding drainage dips; check dams, rock spillways, or removing sloughs or berms. Tread relocation may be needed to avoid bogs, slumps, or other moist areas; this requires establishment of new trail and the closure/restoration of old trail. The tools needed to construct trail may include heavy equipment, power or hand tools, or both.

**Access and Equipment Maintenance** – See this activity type for information related to access and equipment maintenance. Access to the site and the movement of personnel and equipment and supplies will also vary among trail types. The time required to construct or reconstruct a trail will depend on the crew size, the intensity of the work and the location. For example, because only hand tools can be used in wilderness areas, this may increase the amount of time that crews would be present in an area. Hand-held tools include anything that can be carried to the site and held in the hand to operate including a chainsaw, crosscut saw, Pulaski, and/or a hoe dad. Machinery also requires an operator and such examples include backhoes, small tractors, ATVs, and other vehicles designed for trail tread construction and repair.

See the **Mechanical Treatments Activity Type** for additional information related to work elements included here.

*Horses/Weed Free Hay* – If stock is used to pack in material for building trail, the agency is required to use certified weed free feed. On almost all public lands in the west, the public and agencies are required to use certified weed free hay or pellets for livestock.

*Camping* – The selection of camping sites may be needed for crews that remain on or near the work site while conducting trail maintenance, construction or reconstruction. Effects may include: temporary disturbance, prolonged disturbance, and soil erosion, compaction or sedimentation. Usually agency crews are familiar with minimum-impact camping techniques and will choose a campsite that is already established or a site that is resistant to vegetation loss and soil compaction. See the **Prescribed Fire Activity Type** for additional information on campsite descriptions.

*Trail Decommissioning* – Decommissioning may require obliterating the trail so that no sign of the trail remains. This may require scarifying, ripping, and seeding, bringing in brush, or the construction of barriers. The objective would be to allow the area encompassed by the trail to become part of the native surface and terrain. This may require the use of hand and/or power tools as well as heavy equipment. Most frequently, backcountry trails are closed to prevent use and allowed to revegetate naturally, unless there is a high degree of concern about erosion or weeds.

*Ford Maintenance/Construction* – This typically involves stabilizing streambanks to prevent erosion and sedimentation. This may be accomplished with native materials (usually rock) or concrete slabs. Refer to the **Watershed Restoration Activity Type** for additional information.

*Gravel Borrowing/Borrow Pit* – This involves the removal of small amounts of gravel from sources that are either established for that purpose, or can that be easily restored. Where soil types are favorable the borrow material often comes from the immediate site – if it is removed for ditching and drains it can be placed as turnpike material. Tools needed may include heavy equipment, power or hand tools, or both, depending on location and type of trail.

*Reseeding Edges/Bank* – Edges and banks along the trail may need reseeding because of wear. Areas may require some scarification of the seedbed. Native seeds or seedlings may be used or

an annual fast rooting species may be used to stabilize the bank until native vegetation re-establishes itself. In most mountain applications, where seeds are slow to establish and native forbs and grasses have long-lived roots systems, introduction of root-rich soil from the local area is successful at re-establishing ground cover. This treatment, at least in backcountry settings, is labor-intensive and therefore only used for small areas so the disturbance is slight and hand tools are usually the most appropriate. See the Watershed Restoration Activity Type for additional information.

*Tread Construction* – Tread is the area over which most direct travel occurs. Tread may consist only of native material or may consist of non-native surface (such as gravel). Trail tread may extend to the entire width of the trail or some other width depending on the composition of the tread.

*Bridge Building* – Bridges are designed to support the maximum snow load, snow grooming equipment, or pack and saddle stock. Materials such as gabions, lumber, or steel for beams and other heavy items are often flown into the backcountry by helicopter if they are too large or too heavy to pack. In areas near roads, heavy equipment is more likely to be used to set gabions, excavate, pour concrete, and set beams.

*Trail Relocation away from Meadows* – Relocating a trail out of a wet area, or sensitive dry meadow may require all activities related to building new trail and decommissioning old trail.

*Puncheon/Turnpike Construction* – Puncheons and turnpikes are used to stabilize trailbeds in areas with high water tables, and relatively good soils. Ditches are excavated on each side of the trailbed and the excavated material is placed on the trailbed to raise the trail grade above the surrounding water table. It is often necessary to bring borrow material to complete turnpike construction. If the ground is wet, turnpike sections will be allowed to sit through the winter and spring seasons to permit full consolidation before use. Geotextiles may be used in turnpike construction to improve the turnpike's effectiveness.

*Culvert Installation* – This consists of furnishing and installing culverts made of non-native material and/or rock culverts. The work includes backfilling and constructing of catch basins and headwalls. Pipe is laid in a stable foundation of undisturbed or compacted soil and headwalls are constructed at the inlets and outlet ends of pipe. In all locations except where turnpikes are laid, culverts are extended from stream bank to stream bank and are horizontal on top.

*Blasting, Surface, Subsurface and Aerial* – The extent and implementation of blasting depends on the amount of material to be removed and the location of the trail. Typically, in backcountry settings a protruding outcrop or boulder will be removed with relatively small charges. Few trails are being constructed these days that require full-bench cuts in bedrock. In wilderness areas, hand drills are used; outside of wilderness areas hand and power equipment can be used.

*Major Tread Reconstruction (blowout repair, large cribbing projects)* – Tread is the area over which most direct travel occurs. If significant damage to tread has been incurred, material may have to be hauled to the site to repair the tread; corresponding drainage features may also need to

be repaired or reconstructed. Large cribbing projects or retaining wall installation will require the use of fill. The fill may be obtained from a nearby borrow pit, or it may need to be hauled to the site.

**Light Maintenance** - Light maintenance is needed to preserve trails and their related facilities. This may involve a number of activities including but not limited to: installation, clean out and repair of drainage features, removing trees and stumps, protruding rocks, roots, berms and sloughs. Filling ruts and troughs, reshaping backslopes, constructing drainage ditches, finishing treads, and spot filling be needed along the trail.

*Hazard Tree Removal* - See the **Mechanical Treatment Activity Type** for information and description of the removal of hazard trees.

*Installation, Cleanout and Repair of Drainage Features (waterbars, dips)* – When debris and other unwanted material build up in dips, cross-check culverts, or waterbars, improper water runoff and soil erosion can occur. Debris and other material is removed during maintenance activities to allow for proper hydrological function along trails. See the Watershed Activity Type for additional information.

*Signing (blazes, rock cairns, sign posts)* – Signs are used for trail operations and are installed or replaced as needed. Blazes are typically chiseled into a tree bole in a standard heel-and-toe style and may be painted to indicate trail routes. The practice of marking trails with blazes is rarely used anymore. Cairns consist of rocks placed in layers that slope to the center of the structure so that it forms a rough pyramid that can be seen from some distance. Some are built to support signposts and others are used as barriers. Generally, rocks used to construct cairns are gathered near the site. Sometimes they are hauled to the site. Posts for signs may be hauled to a site or they may be produced from nearby trees. This activity may require the use of a chainsaw, posthole digger, auger, and/or pounder.

*Repair of Structures Near Water (bridges, streams, fords)* – Repairing trail structures near water may require the implementation of measures to prevent erosion and sedimentation during and after the work activity. This work would likely require the use of machinery, depending on the type of repair work to be done, and the location of the bridge.

*Repair of Land Structures (puncheons, turnpikes, steps)* – This work may require the use of hand and/or mechanical tools as well as heavy equipment such as a trail machine.

*Minor Tread Reconstruction* – Sections along a trail may need surface repair. Wet areas may need to be hardened with gravel and/or puncheon and turnpikes may need to be installed. Tread reconstruction may be done with manual and/or mechanized tools. Constructing trail tread may require hauling non-native material such as gravel or soil, or by using a Pulaski to expose bare soil. Sometimes a protective aggregate may be applied to the trail surface.

*Non Mechanical Log Clearing and Brushing* – This could require the use of non-powered hand tools such as the Pulaski, saws, and sickles to remove vegetation and commonly used in remote settings and wilderness.

*Mechanical Log Clearing and Brushing* – Chain saws and motorized brush cutters may be used to conduct this maintenance activity outside of wilderness areas.

*Excavating Material Near Water (gravel bar)* – Material may be excavated adjacent to water sources, or within riparian zones when fords are constructed or repaired or bridges and other structures are installed for the trail.

*Excavating Material (borrow pits, trenches)* – Material will be excavated from borrow pits, or trenches and used to “spot repair” tread, or other features in need of maintenance or repair along a trail.

*Debris Removal (Slough, Rocks, Roots)* – Debris can be removed with rakes, or any other tools that will facilitate the removal of leaves, twigs, loose soil, rock or other gathered material on a trail, or within structures related to the proper function of the trail.

### **ACTIVITY TYPE: Roads and Road Maintenance**

Roads are constructed and operated to provide access and mobility. Road construction, reconstruction, operations, and maintenance consist of standardized practices that include many different activity components and work elements. Where appropriate, agency and commercial users are required to remove mud and other debris from vehicles and other equipment. This helps to reduce the likelihood of transporting noxious weeds, non-native plants, and plant diseases to a site.

### **ACTIVITY COMPONENTS AND WORK ELEMENTS**

**Decommissioning Roads** - Roads chosen for decommissioning are those no longer needed for transportation purposes. Such roads may be in poor locations or causing unacceptable sediment loads or disturbance to wildlife or plants. Decommissioning may require the construction of *earth berms*, or work elements such as *revegetation*, *roadbed ripping*, *side cast pullback*, *re-contouring*, *erosion control*, *water barring*, and *culvert removal*. The most important activity associated with road decommissioning is the restoration of hydrological function.

*Closing Open Roads* – Roads may be closed to traffic by using a temporary barricade or more permanent barricade such as an earth berm. Every closed road has its own specific conditions. Roads closed by gates or guardrails may not need blading for safe access by vehicles. Roads closed by a berm will need a bulldozer to remove the berm. Some roads may need a bulldozer or grader to remove rocks, waterbars, soil, and/or vegetation material. Occasionally a stream-crossing culvert may have been removed during the road closure. A temporary stream crossing may be needed for vehicle access. Sometime when replacing a temporary culvert in a live stream, backfill such as drain rock is used. This allows for culvert installation directly in the water with no additional compaction needed for the backfill. No additional sedimentation of the stream will result.

*Re-vegetation* – Re-vegetating areas for road decommissioning, or left bare after construction, reconstruction and/or restoration is important for re-establishing soil and slope stability. Re-

vegetating activities may be accomplished by mechanical or manual means. Seeding, mulching seedling planting, and fertilizing are common practices. Seed mixes, seedlings, vegetation mats, and sediment filters may all be used during re-vegetation. In most cases, native species are used to re-vegetate and stabilize exposed slopes to the extent possible. Invasive species are not used in seed mixes. Native seed mixes may be spread over the disturbed area or the area may be replanted with saved native or nursery stock plants. Revegetation methods are also addressed under **Rangeland Infrastructure** and **Reforestation Activity Types**.

*Re-contouring* – Decommissioning may involve re-contouring the road surface to approximate the pre-road condition. Obliteration involves placing sidecast material back onto the road surface using a large backhoe. Full recontouring means the replacement of sidecast or replacement materials back onto the roadcut to restore the original slope angle. Recontouring normally requires the use of heavy equipment such as excavators. Re-vegetation measures are implemented as appropriate for the site.

*Water Barring* – Water barring is accomplished by using a bulldozer or excavator to dig a trench across the road surface. Water bars forcibly interrupt water flow to prevent erosion and decrease sediment distribution. They are generally placed at a 30 - 40 degree angle to the road surface, and more are installed where road grades increase.

*Roadbed Ripping* - Roadbed ripping can be accomplished with a bulldozer pulling a bar with teeth, or by using an excavator to scarify the roadbed with a toothed bucket. Ripping helps restore water infiltration and facilitates vegetative growth.

*Culvert Removal* – In most cases, culverts and their associated fills are completely removed to return the stream channel to its original width and function. Culvert removal requires the use of mechanical equipment. Small culverts can be removed with rubber-tired backhoes but large culverts may require the use of larger backhoes with metal tracks. Culverts are removed from the site for salvage or disposal. Culvert removal can temporarily increase sediment loads. Appropriate re-vegetation and temporary erosion control measures are generally needed at culvert removal sites.

*Berm Construction* - A berm is a barricade placed at the road entrance and is generally composed of soil or other native materials. Excess material from side cast pull back may be available for its construction. Berm construction is generally done with a bulldozer and a dump truck may be used to haul material to the site. Other items such as boulders, logs, root wads, and/or gates are used to block access.

*Side Cast Pullback* – This is an operation accomplished by using an excavator to pull the material away from a fill slope. The material is then piled against a slope or loaded into a dump truck for removal to a waste area. This activity is implemented during road decommissioning.

**Road Maintenance** - Road maintenance is needed to protect water quality and aquatic resources, to meet access needs and to provide safe and efficient road operations. Road maintenance consists of a variety of activity components and work elements and these will vary by objective and concerns for other resource. Work elements include surface rock replacement

including small quantities of spot surfacing, roadside brushing, erosion control, logging out, road surface blading, ditch cleanout, slide removal, dust abatement, and other items that contribute to the preservation of the existing road.

*Traffic control* – Controlling traffic use and patterns may require the use of permanent signs, special event signs, temporary signs, and/or use of flaggers, special closures, or closures for specific uses. Traffic control can use portions of traffic management such as discouragement techniques to control the volume of use, type of use, or type of vehicle. Signing is needed for special conditions such as log hauling or fire management situations. Road signs may be directional, issue warnings, designate speeds or used for a number of other purposes. Ongoing sign management requires maintenance, installation, removal, and/or repair.

*Blading and Grating* - Blading restores the shape of the road and redistributes aggregate evenly on the roadbed. Blading eliminates potholes, tire wear ruts, and other features that tend to concentrate water and accelerate erosion. This activity helps to make the surface of the roadbed more even, and the substrate more drainable. Graders are used to redistribute rock/gravel by pulling it back to the middle of the road, and then spreading it back over the road to eliminate oversize. On roads with ditches, the grader may be used to clear or clean ditches to allow water to runoff more efficiently. This helps prevent “ponding” in ditches, and/or accumulated water from spilling onto the roadbed. Blading can be implemented so that road materials do not get too far off the roadbed which otherwise can widen the road surface. A roller may be used to compact the road surface following the final blading passes to prevent further sedimentation. Surface blading can temporarily increase sediment production during intense rains and through dusting.

*Disposal Site Use* – Disposal sites are approved areas where disposal material is placed or held until a later date. Disposal material may be buried or piled and may consist of soil, tree stumps, slash, brush or other items such as old culverts. These sites must be located on stable ground, free of sensitive plants and animals, usually out of view of recreation areas, and suitable for the purpose.

*Hazard Tree Removal* – See the **Mechanical Treatment Activity Type** for information related to hazard trees and logging out operations.

*Adding Cross Drain Culverts* – Cross drain culverts are added to areas where water must travel through excessively long ditches. Depending on the size of the culvert, a backhoe with rubber tires or metal tracks may be used for installation. Depending on the topography and site characteristics, catch basins may also need to be installed. Culverts are installed with a minimum of 1 foot of fill placed over the top of the culvert.

*Bridge Maintenance (riprap, deck cleaning, guardrail repair, abutment repair)* – This may occur on decks and guardrails, abutments and sills, protecting riprap, bridge approaches, ramps, and wing walls when needed. The need for maintenance is often exacerbated by fire and fire activity when they are damaged, weakened, or destroyed. Many of these activities will require the use of mechanical tools and heavy equipment; some of these activities may result in minor increased erosion for a given time period. Heavy equipment operation could contribute to disturbances in



an area of concern for wildlife. Newer diesel engines are much quieter than they have been in the past.

*Dust Abatement, Water or Chemical* – Dust abatement is sometimes necessary on roads not having a hardened or paved surface. This is especially needed when the volume and frequency of use keeps the surface stirred and fines become separated and airborne in the form of dust.

*Water dust abatement* is generally accomplished by spreading water on roads with a truck carrying a water tank and a spreader bar attached to the back of the truck. Only approved sources of water can be used for abatement, and sometimes this may require water source development. Water source development must consider volume, time of use, water rights, drain back prevention, sub-grade pad reinforcement, and protection for fish and other resources.

*Chemical dust abatement* involves the use of chemicals that help bind the fines and reduce dust and sediment production. These agents are used when the volume and duration of use make water use too expensive. Common chemical agents used for dust abatement are Calcium Chloride Flake, Lignin Sulfonate, Sodium Chloride, Dust Oils (water based), and other soil stabilizing agents made for that purpose. Volatile cut back dust oils are seldom used. Most common dust abatement agents used today are quite non-toxic to fish and animals in normal concentrations. To be most effective the road surface is prepared by blading, applying water, and then applying dust palliative. Traffic is not allowed on the road until the road has cured. Blotter material is used to soak up excessive dust palliative. Measures are taken to prevent splattering in streams and adjacent vegetation. Pump chance areas and water quality are protected from drain back with berms and aggregate pads constructed prior to use.

*Surface Rocking (rock replacement)* – This is commonly needed for road maintenance. Over time and from a multitude of uses, original surface rock becomes washed, bladed, worn off, and pushed into muddy sub-grade soil. Eventually surface rock needs to be replaced. This is accomplished by loading a dump truck at a commercial source or agency stockpile with surface rock, hauling the rock to a designated site, then dumping the rock out of the truck onto the road. Moving the truck forward distributes the rock over the road, and a grader used to further spread the rock. Subsequently, a roller may be used to compact and harden the road surface. Spot surfacing is similar, but generally limited to the dump truck spreading the rock at specific spots and grading. When the aggregate is dry, it is particularly important to add water prior to blading to prevent segregation and facilitate compaction.

*Slide Removal* – This can be accomplished with a grader, loader or bulldozer. On aggregate surfaced roads, the waste material is loaded into a dump truck and hauled to a designated waste area. Large slide removal generally requires the construction of some type of structure to re-stabilize the roadway. Re-vegetation or other erosion control measures are often taken to reduce erosion from the site.

*Roadside Brushing* – This is done to prevent vegetative growth in the roadbed, and to improve sight distance. Most roadside brushing is done by mechanical removal of trees, branches, and brush. Occasionally, hand tools such as chain saws with regular bars or brushing bars are used. Mechanical brushing is generally done with a road brushing machine that may use a bar or

rotating brush head. A number of passes may be made on each side of the road and generally the uphill side takes more passes. Sometimes a pole saw may be needed to reach limbs on the lower side of the road. Chainsaws are used to cut and remove fallen logs from the roadway and roadsides.

*Opening Closed Roads (including logging out; snowplowing)* - This occurs for special situations such as commercial thinning, prescribed fire activities, fire suppression or fire rehabilitation activity. During emergency situations, closed roads may be opened to allow emergency vehicles and personnel access. Opening closed roads may require removing barriers, knocking down water bars, clearing vegetation in the travel way, snowplowing (see **Reforestation Activity Type**), and/or reconditioning other roadway features. Temporary culvert crossings of streams may be installed with bedding and clean backfill. Closed roads that have been opened may then need to be closed after use.

*Logging Out* - Logging out refers to the removal of downed trees from the roadbed or roadsides; see the **Mechanical Treatments Activity Type** for further details.

*Snowplowing* - Snowplowing may be used to open a closed road for emergency purposes. Snowplowing is detailed under the **Reforestation Activity Type**.

*Ditch Cleanout* - Ditch cleaning is necessary when ditches no longer meet the objective of transporting water to the next cross drain or away from a road or culvert. Water running down the road can increase road surface generated sedimentation, and may overload the next drainage structure, causing a fill failure. Grass, brush, and minor debris is left in place to stabilize the surface, trap sediment, and slow the velocity of water, as long as the ditch adequately handles the expected flow without scour damage to other facilities. Excess material generated through these actions is loaded on a dump truck and hauled to pre-approved disposal sites. Sometimes suitable fines are used to replace lost ones in the aggregate surface of the road. A bulldozer or grader cleans ditches by dropping a corner of the blade into the ditch pushing material along. Occasionally an excavator is used to cleanout ditches that have been filled in by large amounts material and/or vegetation. This re-establishes designed road drainages.

*Culvert Maintenance* - Cleaning culvert inlets or upgrading is done when they no longer effectively handle expected water and storm events. Culverts are also upgraded to better facilitate the passage of fish. *Upgrading* can require replacing a culvert that is too small, changing the inlet structure to better handle flows and debris, or adding more culverts to reduce existing impacts on roadside ditches. Sometime when replacing a temporary culvert in a live stream, backfill such as drain rock is used. This allows for culvert installation directly in the water with no additional compaction needed for the backfill. No additional sedimentation of the stream will result.

**Road Restoration** - This is a relatively new term and often involves components used for both maintenance and reconstruction. Generally, the function of road restoration is to improve road drainage capacity and to add a margin of safety for increased flow. Restoration can reduce the need for recurrent road maintenance. Additional cross drains, rolling dips and/or enlarging culverts are common restoration measures.

Environmental consequences from fires can put additional pressure on structures and other road features needed for proper functioning. Vegetation can be burned off stabilized slopes and banks, increasing the probability of erosion and mass sliding; very hot burns can cause soils to become hydrophobic. Water yield can be magnified several times over putting increased stress on culverts and drainage capacity. Woody debris becomes mobilized making drainage plugging a problem.

*Stormproofing* – This involves the implementation of management practices that substantially reduce the potential for erosion, sedimentation, and mass wasting, while still allowing road use. Stormproofing for road restoration may require constructing dips or waterbars, installing additional culverts, and/or upgrading existing culverts with larger, newer, or with special inlet sections and/or debris racks. It may also involve reshaping the roadway, disconnecting ditches (diverting flow – not relying on ditch flow) and surfacing the roadway. Slope stability can be restored with re-vegetating efforts such as seeding, fertilizing, mulching, vegetation mats, or sediment filters. See the Reforestation and Range Infrastructure Activity Types for additional revegetation information. Vegetative re-growth and forest litter, now allowed to accumulate on the roadbed, enables the road surface to regain its hydrological function.

*Bridge Replacement* – Bridges are replaced when they are destroyed by fire or have become too old to function safely. Bridges are also replaced when they cannot provide access and mobility as needed (e.g., updating from single to double lane), and/or when the original design cannot pass anticipated flood flow events. Bridge replacement can range from replacing the decking, deck or the entire bridge including the abutments. Bridge replacement procedures will vary according to the design, size, type and configuration of the bridge. Large cranes and other heavy equipment are used to remove and install bridges. Minor short-term impacts to water quality are likely to occur.

*Installation of Drainage Dips and Waterbars* -Roadbed drainage features, such as dips and waterbars, are preferred to facilitate roadbed drainage. Dips or waterbars are not “maintenance dependent” like their counterparts, and work almost indefinitely even with minor slumping of cut banks into the roadbed. They have the added benefit of helping to stormproof the road, or providing an added measure of safety for storm events in the event of overtopping. Installing water bars and dips usually requires the use of mechanical and heavy equipment.

*Culvert Installation and Upgrade* – Culverts are installed where they are needed to reduce soil erosion and run-off. Installation requires procedures be implemented that will minimize sedimentation and turbidity during the installation of in-channel structures, properly accommodate stream discharge, bedload and debris to reduce road failure risk, provide for stream function (by installing a buffering device that intercepts road surface erosion), and provide a fish passage if fish are present. All culverts must be sized to accommodate 100-year flood events. Culvert installation usually requires the use of mechanical tools and heavy equipment such as backhoes, bulldozers, and dump trucks. After a trench to accommodate a culvert is dug, rock may be placed where the culvert will lie in the trench. Fill is placed on top of the culvert in layers that are compacted.

*Surface Shaping and Draining* – On high traffic roads, surface shaping and drainage are needed to keep the road dry. Simply grading the road usually completes shaping the surface, this allows for proper drainage. See *road blading* (found above) for additional information.

*Surface Material Processing (in place rock crushing)* – Processing surface material can be accomplished many different ways. From crushing operations to blading and re-distributing rock on the road will “process” material. Binder may be added to an aggregate being used to surface the road, and this can be re-mixed while it is being graded on the road surface. Rock pit plans are designed to minimize adverse effects of excavation and processing of rock materials. The plans will cover erosion control measures needed during and after pit preparation.

## **New Construction/Reconstruction**

Locating stable slopes, avoiding wetlands, and choosing areas where proper drainage can be accomplished is necessary for any new road construction or reconstruction. New construction or reconstruction may include clearing, excavation, embankment, installation of drainage features and structures, and sometimes surfacing and re-alignment.

*Vegetation Clearing (pioneering activities)* – Trees, brush and all other vegetative materials are cleared from the area so that roadbed construction can begin. Bulldozers, graders, backhoes, and power tools such as chainsaws and roadside brushers may all be used. Vegetation is seldom cleared beyond the top of a cut, or fill toe. Sometimes vegetation is left in the lower section of the fill area on temporary roads.

*Installation of Drainage Features (including bridge construction)* - Under fill drainage refers to installing culverts and bridges. These structures may be permanent or temporary, and are designed to allow for fish passage when needed. They help reduce sedimentation in streams during construction, as well as avoid erosion after construction. Culverts used on fish-bearing streams are all designed for 100-year flood events. The diversion of water around the culvert installation site is done to protect water quality. De-watering occurs when working in the stream channel. Sediment fencing, other erosion control measures, or the use of clean “drain rock” bedding and backfill (at least halfway up on culvert) is used during culvert installation.

*Earthwork* - Excavation and embankment refers to building a road out of the slope of the ground. This requires excavation, hauling of material, and filling across drainages and depressions.

*Finish* – Many different types of “finishes” may be used to complete the surface of a road. Some roads may only need a “dozer finish” and other roads may need an asphalt finish. The majority of roads on Forest Service and Bureau of Land Management lands have a grader finish.

*Surfacing* - Surfacing is designed to meet anticipated road use. Native surfacing is generally used on low volume roads. On occasion, aggregate is used to help stabilize moisture-sensitive sub-grades and protect against erosion on erosive surfaces.

## **ADDITIONAL ROAD NARRATIVE INFORMATION**

## Road Maintenance Levels

Level 1 – Roads which are physically closed for long periods and may be opened only for selected activities. These roads are probably not surfaced other than with native materials. When these roads are open, only vehicles with high clearance may be used on these roads, and passenger cars are not given consideration.

Level 2 – Roads which are usually open, but may be seasonally closed. These roads are probably not surfaced other than with native materials. These roads are maintained for high clearance vehicles. Passenger cars are permitted, however, these roads are not maintained for such. These roads receive minor average daily traffic (ADT).

Level 3 - Roads which are opened and maintained for the prudent driving of passenger cars. These roads meet Highway Safety Act standards. These roads are single land roads with turnouts and are used at typically low speeds. Road user comfort and convenience is not given priority. The surface of these of roads may be composed of native or aggregate material.

Level 4 – Roads which are opened, maintained and provide a moderate degree of user comfort and convenience. These roads are traveled at moderate speeds and they meet Highway Safety Act standards. The majority of these roads are double lane, although, some may be single lane with turnouts. The surface of these of roads is composed of aggregate material or pavement.

Level 5 - Roads which are open, maintained, and provide a high degree of user comfort and convenience. These roads meet Highway Safety Act standards, are normally paved and have double lanes. Some of these roads may have aggregate and dust abated.

### **ACTIVITY TYPE: Range Infrastructure**

Fire prevention actions and post fire activities in rangelands may require rehabilitation of native ranges and construction, repair or replacement of range improvement structures. Fences and water developments are common structures used for livestock management and/or protection of rangeland resources. The construction, reconstruction, and maintenance of fences and water developments and rangeland restoration activities may require the use and hauling of heavy equipment, and the hauling and storage of materials. See the **Access and Equipment Maintenance Activity Type** for information related to these activities.

### **ACTIVITY COMPONENTS WORK ELEMENTS**

**Fence Construction, Reconstruction, and Maintenance** – These activities normally require material transport, ground disturbance, and the use of power tools or large equipment. Materials for wooden fences may be gathered and prepared on or near the construction site. This work generally is accomplished with power tools. Standing trees may be used where available and incorporated into the fence design for strength and cost savings.

*Stringing Wire* - Wire is strung and attached to fence posts with clips. ATV's and pickups trucks are commonly used to string wire.

*Digging Post Holes (manual / mechanical)* - Posts may be set at times using a tractor with an auger or pounder and tractors. Posts are wooden or metal. Fence repair or reconstruction may require any or all of the above types of work related to fence construction

*Clearing Right of Way* –This is accomplished in timber or brush with minimum clearing widths commonly four to five feet on either side of fence. Clearing methods are comprised of hand tools, or with mechanized equipment such as chain saws, brush hogs, road graders and bulldozers. Hazard tree removal may be necessary to protect fencing and work sites.

*Building Rock Jacks* – Rock jacks and rock cribs are used to anchor a fence. Both are built with rock, wood, or metal posts. Rock drills may be used to create anchor points where solid rock is available.

*Onsite Material Cutting, Gathering Rocks, etc* – Cutting trees for fence posts will generally require the use of chainsaws, or hand saws depending on the need. Rocks are gathered at the site or hauled in when they are not available to build rock jacks and cribs.

*Pre-project Weed Control* – See the **Weed/Chemical Activity Type** for implementing weed control procedures.

*Spike/Work Camps*- See the **Prescribed Fire Activity Type** for work elements associated with camps.

**Rangeland Restoration** – Restoration of native vegetation and natural site conditions may be needed following both wild and prescribed fires, particularly in previously degraded sites or where invasive species are likely to establish. Restoration activities are generally designed to facilitate immediate or eventual re-establishment of native vegetation (grasses, forbs and shrubs), and site conditions that will promote native vegetation establishment). The establishment of certain native species that are less susceptible to fire is necessary to restore the natural function of native vegetative communities. An example would be cheat grass infested sites that tend to burn every few years, not allowing native species to get established, which are less susceptible to frequent fires and allow shrubs to establish

Preparing the seedbed for seeds and/or seedlings is a necessary step in most cases. Mechanical methods such as chaining, rangeland plowing, and disking are commonly used to prepare a seedbed for planting by roughening soil surfaces, damaging or killing existing unwanted vegetation, and facilitating the planting process. Roughening the soil surface loosens soils, reduces soil crusts, allows for water retention, and reduces wind speed and temperature extremes. These conditions are desirable for successful seed germination and plant survival.

*Aerial Seeding* - Aerial application by fixed wing or helicopter is used to seed vast areas or to facilitate the success in establishment of a specific species.

*Seeding Disking (drilling, fertilizing, plowing)* - Disks are attached to tractors and are generally used to temporarily break surface crusts and kill shallow rooted plants (weeds). These are typically used on sites with lower shrub densities dominated by grasses and forbs.

*Seeding Drilling* – Rangeland drills are used to plant seeds when uniform seed distribution and proper seed depth are required for plant establishment. Rangeland drills are attached to back of a tractor and requires a firm seedbed and uniform terrain without obstructions to operate effectively.

*Seeding Fertilization* – *Fertilizer* may be used to enhance the seedling germination and increase seedling survival. Fertilizer can increase the potential of noxious weed establishment if a seed source is present. Fertilizers can be broadcasted or aerially applied.

*Seeding Rangeland Plows* - *Plows* attached to tractors are used to improve crusted or compacted soil, at least temporarily, and kill or damage competing vegetation. These are used on sites where grasses dominate.

*Chaining* - Chaining is used to remove and or destroy vegetation. Chain-dikers have disks welded to the links of an anchor chain. This is pulled behind a crawler tractor and as the chain rotates it improves tillage, land smoothing and basin formation, in a single pass. This is the most effective method for preparing seedbeds on sites with relatively large amounts brush and other woody debris.

*Prescribed Fire* – See the **Prescribed Fire Activity Type** for work elements associated with this treatment.

**Water Development Construction/Reconstruction (springs, guzzlers, tanks, ponds, reservoirs and wells)** – Several types of water developments may be needed to implement livestock allotment plans, or enhance and protect an area's other resource values.

*Rock Haul/Material Haul* - Transporting materials to the site can be done by human-power, pack animals, all-terrain-vehicles, pickup truck, or helicopter. Material transport may create disturbance along transport routes and at the site. Disturbance potential is dependent on the time of year, duration, frequency, and habitat through which the transport occurs.

*Earthwork (cat, dragline, scraper)* – Ponds and/or dams are always constructed with heavy equipment (e.g., dozers, backhoes or scrapers). Material for dam construction is usually excavated from the catchment area, and heavy equipment repeatedly hauls material to heighten the dam. Likewise, for dam maintenance, silt must be excavated from the catchment area, sometimes using a dragline to pull material from the catchment area. Sometimes material must be hauled in for dam construction or for a water holding basin.

*Pipelines (trenching)* - Pipelines are used to transport water from a water source (i.e. creek, developed spring, or well) to another location. Pipeline construction includes transporting materials, trenching (usually with a backhoe or trencher), and installing troughs.

*All Water Developments – Clearing* - Clearing an area for the installation of a water development may be accomplished by any number of methods, manual or mechanical. Vegetation may be cleared with a dozer, weed-whacker, brushbuster, rake, hoe, or chainsaw.

See **Reforestation, Mechanical Treatments, or Weeds and Chemical Treatments Activity Types** for additional information and descriptions.

*All Water Developments – Transporting Materials* – Material transport for water developments may be by truck or helicopter. Repair, construction or reconstruction of any water holding device (be it natural or artificial), requires transport of materials by person, on and/or off-road vehicles, helicopter, or by pack animal. Transport may occur off designated roads or trails, at times requiring lengthy cross-country travel. Generally, transportation of large water catchments with high storage capabilities utilized for livestock guzzlers is not practical.

*All Water Developments – Installing Troughs, Storage Tanks, or Pits* - Spring development generally requires excavation of the water source by hand, or with heavy equipment (e.g., backhoes or trenchers) to install a head box or perforated pipe. Normally trenching buries pipe from the head box to the trough and from the trough to the overflow pipe. A *trough or troughs* are installed and the water source is fenced to exclude livestock. *Guzzlers or trick tanks* are water storage containers catch and store water for wildlife and livestock use and generally are built where no natural water sources such as streams, springs or ponds exist. They may also be built to draw livestock away from natural water sources or decrease their use.

Storage containers, made of fiberglass, metal, or a bladder-lined pit, can hold up to 10,000 gallons for livestock use. Storage containers for wildlife guzzlers are much smaller (1,000 gallons) and containing two or three polyurethane or metal tanks per site. Containers are plumbed to aprons and then water is piped to a trough or troughs where livestock drink. Typically, areas around catchments are fenced to exclude livestock. Smaller storage tanks used for wildlife guzzlers often require *earthwork* for burial and a small dozer typically is used for removal and backfill of soil. These tanks may be repeatedly checked four or more times a year to ensure proper functioning.

*All Water Developments - Installing/Building Fence Around Development* – See the activity component fence construction, contained within this activity type for information.

*All Water Developments - Constructing Apron - Rubber, Metal and Asphalt* - Guzzler catchments (often called aprons), catch and store precipitation and generally are made of rubber, sheet metal or asphalt; varying in size depending on size of the storage container.

### **ACTIVITY TYPE: Prescribed Fire**

Prescribed fire projects are part of vegetation manipulation projects that reduce hazardous fuels and restore natural ecosystems. Prescribed fire projects are often a combination of numerous activity types. The actual application of fire is often only a small part of the total project. Prior to ignition of the prescribed fire, other work activities must occur to prepare the project area for the fire. For example, in remote locations, camps will be established and supplied. Following wildland and prescribed fires, rehabilitation work may be needed to mitigate impacts caused by implementation. Each project has its own special set of conditions, and its own combination of activities.



## ACTIVITY COMPONENTS AND WORK ELEMENTS

### Fire Support

See the **Roads and Road Maintenance Activity Type** for information related to road use and maintenance associated with prescribed fire activities.

*Fire/Spike Camps* - Some prescribed fire projects are conducted at remote locations. Personnel conducting the project must camp near the project area. The size of any particular campsite, and the complexity of the logistic support operations are determined by the magnitude of the project.

Large prescribed fire projects in remote locations may require that personnel camp near the project site. This helps to increase the amount of time spent on site, and reduces potential hazards to personnel traveling to and from the project area. This can be especially important when crews are working long hours and driving prior to sunrise and after sunset. There will be areas for tents, cooking and dining, restrooms, parking for vehicles, and sometimes for helibase/helispot activities. Logistical support of large camps often requires daily shuttles of supplies and resources. Large camps will often be placed in accessible areas with good road access.

Spike camps are often set up on less complex prescribed fire projects, or in the early stages of the project. These camps require less logistical support and will occupy a smaller total area. Small camps will have similar components to large camps but total number of personnel will be less. These camps are also set up in less accessible areas, are more self-contained and daily supply is not necessary.

**Fireline Construction/Holding Actions** - There are numerous techniques used to build fireline. The overall goal of fireline construction is to remove living and dead vegetation (fuel), or to create a break in the continuity of the fuel. Creating fuel breaks help to stop fire spread. Flame lengths and fuel type is used to determine the width of a fireline

*Machine Built Fireline* – This type of fireline is created using mechanized equipment. Bulldozers, tractors with plows, road graders, or even four-wheelers can be used for line construction. Machine built firelines are typically constructed on level terrain having less than a 15 % slope and relatively free of surface rocks. Machine built fireline is used when a fuel break needs to be wide and/or lengthy, or when smaller fires have the potential to rapidly grow. The ground must also be relatively free of large surface rocks. Plows, dozers, blades, or other implements are pulled or pushed just below the soil surface and mineral soil is exposed. On ground that is fairly level and has few surface rocks, a brush beater (heavy duty mower) can be used to create a fireline. Brush-beat lines do not expose mineral soil and must be supported by other activities. The width of the line is dependent on the potential flame length.

*Wet Line/Foam Line* – Water, water with surfactants, or aqueous firefighting foam (AFFF, or A Triple F) are used to create a fireline. These substances are sprayed on vegetation to increase moisture content and limit fire spread. Wet lines are most often used in short vegetation or fuel (i.e. grass, pine needles) and where flame lengths are short. Wet lines are also used in

conjunction with burnout or black lining operations. Vegetation and dead fuel will be sprayed with water or foam. Wet lines have the lowest impact of any human constructed fireline. The line will only be effective as long as the vegetation remains wet. Once the vegetation dries, fire will easily cross the line. Aqueous firefighting foam (AFFF) helps to stretch water and keep vegetation wet longer, but its effects are also temporary. Use of wet lines and foam lines require large amounts of water; a reliable water source must be in the area to support these operations.

*Pumping from Streams/Ponds Using Portable Pumps* – Water from ponds and streams may be drawn using portable pumps. A two-inch suction hose with a screen on the end is placed in the water source. The water is then pumped to hose lays on the fireline, into large portable storage tanks or bladders, and fire engines and/or water tenders. Under some circumstances, a dam is constructed in a stream to create a pool deep enough to pull water. Portable pumps are often used in areas where fire engines or water tenders cannot access the water source.

*Drafting to Fill Engines and Tenders* – Water from ponds and streams is used to fill water tanks on fire engines and water tenders. Pumps mounted to the engines or tenders are used to pull water from the pond or stream. The water source must be located in an area where vehicles can drive to within 10 to 15 feet of the water's edge. Water sources are often found next to roads or near bridges. A hard suction hose, with a screen over the end, is placed in the water. Water is used by the engine, transported to a portable tank, or pumped through hose lays. Under some circumstances, the water source must be improved to gain adequate depth for the end of the suction hose to be completely submerged.

*Natural Barriers, Riparian and Wetlands* – Natural breaks in vegetation and fuel are used when available to help contain prescribed fires. Natural barriers require little if any improvement to stop fire spread. These areas are often rocky ridges or scab flats where the arrangement of vegetation is such that fire cannot move through the plant community. Riparian areas or wetlands are also used as firelines. The vegetation in these areas is too wet to support combustion and is very effective at limiting fire spread. Prescribed fires that use these areas for firelines must conduct activities while these areas are wet. Once they dry for the season, riparian areas or wetlands are no longer effective at limiting fire spread.

*Helicopter Dipping* – Buckets suspended beneath helicopters may be used for prescribed fires to strengthen the fireline, or to quickly treat hot spots. The pilot controls the bucket remotely. These buckets will most often carry from 100 to 250 gallons of water. Water is obtained from nearby water sources. The helicopter will hover close to the water surface and allow the bucket to fill. This type of operation requires a large water source sufficient to supply the needed water. Lakes, ponds, larger streams, and rivers are the most frequent sites used to dip water. Helicopter operations require that a helibase or helispot be located close to the project for support.

*Hand Built Fireline* – The most common form of fireline is constructed using hand tools. The goal is the same as with the other types of fireline: remove the burnable material from the fire. All plant material and downed dead material are removed and mineral soil is exposed. In some instances, chainsaws are used to help remove shrubs and trees and/or branches. Hand built fireline will often be used in conjunction with other activities, such as black lining, wet lining, and brush beating. The width of the line is dependent on the type of fuel in the area and the

current or expected flame length. Where lines greater than 2 - 3 feet are needed, machinery is often used. Crews of up to 20 people are used to create these lines.

*Explosive Built Fireline* – In some areas explosives are used to create fireline. This technique is used only under special circumstances and is uncommon. An explosive device, similar to a small diameter hose or small rope, is laid across the ground or used to fall trees. Long runs can be done very quickly. The explosion will expose mineral soils and stop fire spread by removing the burnable fuel.

*Black Line* - Black lines are pre-burned areas that are used as firelines. Black lines are often used in conjunction with another type of fireline. The other type of fireline is constructed and the vegetation is ignited on the inside of the fireline. The hand built, machine built or other fireline is used to keep the fire within the boundaries of the prescribed fire unit. In some cases, a second fireline is constructed and all the burnable material between the two lines is burned. This gives the fire managers the greatest control of the black line operation. In other cases, there is no second fireline and the fire is allowed to burn into the unit. Ignition is often done later in the day to take advantage of cooler night conditions and increases in relative humidity. Black lining can provide a wide fireline without the disturbance that occurs with other methods.

**Helicopter Landing Sites and Other Operational Facilities** - Many prescribed fires use helicopters for some portion of the operation.

*Helicopter Support Sites; refuel, alumigel mix sites, etc.* - In remote areas, a temporary facility may be needed to manage the helicopter operations. The size of the helispot will be based on the type of the helicopter, equipment needed, and number of aircraft being used. The helispot will often be located next to a road for ground transport of supplies. The helispot must also have a firm, level surface, and a free line of travel that is clear of obstacles in and out for takeoffs and landings.

A helicopter is used to transport personnel and equipment when an area is remote and inaccessible. The personnel and equipment may be loaded at the helibase or on site helispot. Landing areas require a firm level surface free of obstructions. The size of the landing area will be dependent on the type of helicopter used. In areas where landing is not possible, equipment will be delivered via a long-line. Equipment is attached to a line suspended from beneath the helicopter, then transported and placed in a designated area. Long-line operations have a minimal impact because the area needed to drop equipment is much smaller than that needed to land a helicopter.

*Helicopter Refuel* – Helicopter refueling is often done at the helispot. The fuel truck is driven to the helispot and fuel is pumped from the truck's fuel tank to the helicopter. Fuel trucks meet all Department of Transportation (DOT), and Federal Aviation Administration (FAA) regulations regarding fuel transport and transfer.

*Alumigel Mix Sites* – If a helitorch is used on the project, an area to mix alumigel will be established near the helispot. The alumigel is the fuel for the helitorch. Transport and mixing is

done under regulations designated by DOT and FAA. The mixing requires a level area in close proximity of the helispot.

**Ignition** - The actual application of fire to the landscape can be done using a variety of different techniques and equipment. Fire can be applied using drip torches, from a mechanized piece of equipment with an ignition device, or by a firefighter walking through the prescribed fire unit. Fire can also be applied from the air using a helitorch or a device that drops ping-pong ball sized spheres filled with a flammable chemical. These spheres ignite after contact with the ground.

*Hand Ignition* – Ignition by ground personnel using drip torches is one of the most common methods. Fire personnel will walk through the unit using drip torches to ignite the area in a set pattern. The torches contain a mixture of gasoline and diesel fuel. Activities associated with this type of ignition would be minimal. Hand ignition gives the fire managers the highest level of control over the ignition pattern.

*Mechanized Ignition* – In relatively flat terrain, or along roads, mechanized equipment may be used to ignite fuel within the prescribed fire unit. Larger versions of drip torches are mounted to 4-wheelers, pickup trucks, or other vehicles and driven along a road or through the unit igniting the vegetation in a preset pattern. Mechanized ignition allows large areas to be covered in a shorter time period. This is important in larger prescribed fire units. Tera-torches are also mounted on vehicles and can be used in prescribed fire operations.

*Aerial Ignition (helitorch, ping-pong balls)* – Helicopters are the principle platform for aerial application of fire. Application of fire using helicopters allows large, inaccessible areas to be treated with minimal impacts outside of the fire on the ground. These operations require support at the airport or helispot.

*Helitorch* – Helicopters can carry a large version of a drip torch capable of applying large amounts of fire to a unit. Helitorch operations are most frequently conducted in areas with large fuels (logs, trees, slash); more recently, this tool is being used in lighter fuel types. The helitorch allows fire managers to ignite a large area relatively short amount of time. The mobility and lack of ground impact is making its use more common. These operations are supported by an alumagel mixing operation at the helispot or landing area.

*Ping-pong Balls* – Another device commonly used with helicopters is a “ping-pong” ball dispenser. These ping-pong ball sized spheres are filled with potassium permanganate. Just before the balls are dropped from the helicopter, the balls are injected with ethylene glycol. The chemical reaction generates heat and the balls will ignite after they hit the ground. Balls may be dispensed in a pre-determined pattern. This technique allows the fire manager to treat a large area in a short time. This technique is used in lighter fuels in the forest, mainly for under burns, but recently its use is becoming more common in shrub-steppe habitats.

**Mop-Up** - Once objectives have been achieved and ignition is no longer taking place, fire managers must extinguish hot spots within the prescribed fire unit. This is the mop-up phase of the fire. Hot spots are often stumps, downed logs, or other accumulations of dead material that continue to burn after the majority of the fire in the unit has gone out. Firefighters will use a

combination of hand tools, fire engines, and hose lays to make sure the fire is contained within the unit before it is abandoned. Standards of mop-up will vary from unit to unit. In most cases, the burning material is exposed and cooled with water and/or soil.

*Engine* – Fire engines will be used on flat terrain to bring water to the hot spots. Areas must also be free of rocks, or downed material that would limit access by fire engines. Firefighters will use water and hand tools to cool the hot spot. Engines will drive up to the hot spot, or use hose lays to bring water from the engine to the hot spot.

*Hand Tools* – Firefighters will use hand tools to cool hotspots. Shovels, backpack pumps, and other hand-carried tools (e.g., the Pulaski), are used in areas inaccessible to vehicles, and laying hose. Firefighters will use water from backpack pumps, and moisture in the soil, to cool hot spots. In some circumstances, firefighters will only use soil to cool hot spots.

*Hose Lays* – In areas where vehicles cannot travel, hose will be placed along the ground and supplied by portable pumps, fire engines or water tenders. Firefighters will use the water and hand tools to cool the remaining hot spots. Long runs of hose can be laid, but once down it is difficult to move. In most cases hose lays are limited to the perimeter of the prescribed fire unit.

See the Salmonid Criteria for more information on this Activity Component.

### **ACTIVITY TYPE: Defensible Space**

Defensible space is an area, typically 30 to 120 feet wide that lies between improved property with human developments, and potential wildland fire areas. It is within this space that combustible materials are removed or modified making them safer for fire operations to defend and protect.

The threat to life and property from wildfire is a significant issue for federal, state, and local fire planning agencies responsible for protecting residential areas (and their associated developments) in close proximity to wildlands. This issue is currently at the forefront of fire management and protection policies at national and local levels. Areas determined susceptible to threat of wildland fire are called wildland-urban interfaces (WUI).

The WUI consists of areas with human populations and developments, as well as other areas of special significance that lie within or adjacent to areas wildlands. Developed areas on private, state and federal lands that may need fuel reduction treatments include but are **not** limited to: private residences, recreation and business centers, campgrounds, communication towers, high voltage transmission lines, church camps, scout camps, research facilities, summer homes or ranger stations, ranches and outbuildings.

To make human developments, administrative sites, and other areas of special significance less susceptible to wildland fires, implementation of one or more of the following activity types may be necessary: **Mechanical Treatments** (hazard tree removal, thinning, hand-piling), **Prescribed Fire, Reforestation, Weeds and Chemical Treatments, and Access and Equipment Maintenance**.

Treatments that may be used to reduce the risk of wildland fire or create defensible space are not limited in application to communities, private residences, or other private developments. These treatment applications may be implemented for any public facility or development, or area of special significance that occurs on state or federal lands.

## **ACTIVITY COMPONENTS AND WORK ELEMENTS**

### **Fuels Reduction**

*Remove Plants or Plant Parts* – The removal and/or reduction of flammable plants and plant parts such as dead trees, branches, flammable brush, grasses and leaves is a common practice. Fuels reduction treatments may include under or overstory thinning, selective tree harvest or complete removal of dense forest stands. Other important treatments include pruning dead wood from shrubs, removing low tree branches, mowing dried grass, and/or piling brush and down trees for removal or subsequent burning under safe conditions.

*Replace Flammable Plants with Less Flammable Plants* – An example of this work element is replacing highly flammable shrubs with irrigated and well-maintained flowerbeds and lawns.

### **Structure Modifications**

Structures would include homes and their associated buildings, developments and structures within administrative sites, or any others that may or may not be listed above.

*Replace Flammable Roof Materials* – Replace flammable roof materials (e.g., cedar shingles) with “Class C” fire resistant roofing (metal or asphalt) or better.

*Remove Ignitable Materials Surrounding Structures* – Some examples include: removing ignitable materials from around chimneys, within gutters, off sidewalks or any other home, lawn, or structural features and attachments that may collect ignitable materials.

## **ACTIVITY TYPE: Abandoned Mine Restoration**

Restoration requires implementation of work activities and elements that will render an abandoned mine safe for human health and environmental function. Activities include assessments, inventories, and analyses for identification of hazardous and non-hazardous wastes. Non-hazardous wastes are typically removed. Hazardous wastes are treated for removal, or treated and contained at the site. Mine openings must be closed and this is accomplished in a variety of ways depending on the site’s location, environmental features, and concerns for other resources. Other actions may include restoring hydrological function and stream channels, and re-vegetating areas.

## **ACTIVITY COMPONENTS AND WORK ELEMENTS**

**Access and Equipment Maintenance** – See this activity type for information related to access and heavy equipment use and maintenance. Almost all of the work elements associated with abandoned restoration requires the use of heavy and mechanized equipment.

**Mining Waste Cleanup** - Abandoned mines may contain hazardous and non-hazardous wastes; soils become contaminated from hazardous materials leaks. Waste materials must be identified, treated, and removed from the site, or treated on-site and contained in a manner that eliminates further contamination. Restoration consists of standardized practices that include the following activity components and their associated work elements:

*Removal Action/Junk Removal* - Mining waste cleanup may require *removal* of non-hazardous wastes in the form of wood, metals, household junk, and other trash left at the site after the mining operations ceased. These wastes can be collected and transported to a landfill.

*Preliminary Assessments, Inventories, Analyses* - Assessments, inventories, and analyses of wood structures, soils, and sediments for hazardous waste content must first be performed to identify whether special handling and removal techniques are needed.

*Contaminated Soil Removal* - Removal includes excavation, containment, and transportation of contaminated soils to an appropriate disposal facility, or requires construction of an on-site containment structure. On-site containment structures are excavated cells lined with an impermeable substance, and capped with cement.

*Site Investigation - Chemical Sampling* - Detailed assessments are conducted by sampling and analysis of chemical parameters including pH, total dissolved solids, and suspected chemical contaminants including heavy metals. These procedures are necessary to determine if a hazardous waste situation exists.

*Barrel Removal* - Removal usually requires identification of barrel contents and over-packing the barrel in a larger, plastic drum. Barrels are then removed from the site to an appropriate disposal site.

*Reclamation Plan Implementation* – This includes the implementation of the plan of operations constructed for restoration. It may require all of a combination of all of the work elements included within this activity type.

**Mine Site/Abandoned Mine Reclamation** - Abandoned mines have tailings (crushed rock waste piles) left over from the extraction of desired economic minerals. When tailings are placed in stream channels and block the normal flow of water, digging a new stream channel is required to restore surface flow.

**Roads and Road Maintenance** - See **Roads and Road Maintenance Activity Type** for information related to roads and road maintenance that may be needed for abandoned mine restoration.

*Restore Surface Flow/Floodplain Reclamation* - Reclamation involves removal of tailings or waste rock, and possible reestablishment of water flow into historic floodplains.

*Mine Shaft Backfilling* – Mine tailings or waste rock are placed back into used dry and stable mineshafts. If the shaft cannot be effectively backfilled, a secure cap or cover may be placed over the opening.

*Removal Of Hazardous Waste (Hazmat)* – The removal of Hazmat materials and garbage removal is consistent with “mining waste clean-up”, described above.

*Closing Mine Openings, Adits, and Stopes - Gates, Foam Sealant Backfilling, Blasting* – This is the process of physically blocking an opening used for mining operations leading underground. Mine openings may be closed with bat-friendly gates if the mine has bat habitat, or the closure can be completely blocked with the use of a *foam sealant*, or *backfill* (see mine shaft backfilling above). Explosives may be used to *blast* surrounding rock to create a rock fall in front of the opening.

*Wetlands Reclamation - Remove Contaminated Soil* - Reclamation involves removal of tailings or waste rock, and possible reestablishment of water flow into historic floodplains. Removal includes excavation, containment, and transportation of contaminated soils to an appropriate disposal facility, or requires construction of an on-site containment structure.

*Wetlands Reclamation - Restore Stream Channel* –Large surface mining operations, placer mining activities, and the dumping of waste rock or tailings from hardrock mining can alter stream channels. To restore proper channel flow, removal or reshaping of waste materials, and possibly placement of impermeable structures across stream channels to raise water tables may be necessary.

*Wetlands Reclamation - Construct Cell* - Cells are on-site containment structures, which hold contaminated soil. These cells are excavated and lined with an impermeable substance, and capped.

*Tailings Impoundment Rehabilitation - Water Management* - Rehabilitation by stabilization of large, constructed tailings piles that were formed like a reservoir; a dam is placed at the lower end, with tailings flowing out in the form of slurry behind the dam. Tailings piles reservoirs are subject to erosion and water is channeled off the top of the piles or away from the toe of the dam.

*Tailings Impoundment Rehabilitation - Cap Impoundment* – This activity consists of placing a resistant cap on top of tailings to prevent further erosion.

*Dredge Tailings Restoration - Aerial Videography* – Determination of the lateral extent of dredge tailings piles and estimation of original stream channel location.

*Dredge Tailings Restoration - Tailings Redistribution* - Redistribution of dredge tailings, according to plans, is a major activity associated with this type of restoration. This activity is used to stabilize large, undulating piles of unsorted cobbles, gravels, and rocks usually found in,



and adjacent to old stream channels left from large floating dredges used for gold mining.

*Dredge Tailings Restoration - Restore Channel Flow* – Large surface mining operations, placer mining activities, and the dumping of waste rock or tailings from hardrock mining can alter stream channels. To restore proper channel flow, removal or reshaping of waste materials, and possibly placement of impermeable structures across stream channels to raise water tables may be necessary.

*Groundwater Control - Reroute* - Control is necessary when contaminated groundwater is present from mining operations. Rerouting contaminated surface waters through a water treatment facility, either active or passive, can mitigate further groundwater contamination, or prevent possible contamination if none currently exists.

*Groundwater Control - Treat* - Appropriate measures (i.e. excavation of contaminant source, injection of materials to immobilize the contaminants) must be taken for treatment of contaminated ground water.

*Groundwater Control - Test* - Groundwater must be *tested* by sampling and chemical analysis to determine extent of any contamination.

*Mine Waste Dump Removal - Treat* – Tested contaminated materials indicating the presence of hazardous materials in quantities above legal limits, must follow hazardous material removal protocol for removal, transportation, treatment, and disposal. Treatment may be on-site prior to transportation, or after transportation and prior to disposal.

*Mine Waste Dump Removal - Test* - Removal involves first testing materials to determine if contents are hazardous. If not hazardous, then excavation, transportation, and disposal of wastes can occur.

*Mine Waste Dump Removal - Inventory and Monitor* – Site inventory is necessary to determine whether adverse environmental impacts are occurring, and if so, an assessment as to the severity or extent of impact needs to occur to prioritize projects so that reclamation activities may be implemented. Subsequent monitoring of sites may be necessary.

*Mine Waste Dump Removal - Revegetation* – Revegetation is necessary for most reclamation. Vegetation stabilizes soil and helps to bind some contaminants from the old mine sites. See **Range Infrastructure (rangeland restoration), Reforestation, and Chemical and Weed Treatments Activity Types** for additional information concerning revegetation activities.

## **ACTIVITY TYPE: Insect Suppression**

### **ACTIVITY COMPONENTS AND WORK ELEMENTS**

These projects cover a wide variety of insect and disease prevention and suppression activities. Insects and diseases can increase stand flammability by causing mortality and increasing slash. In addition to increased mortality, dwarf mistletoe infestations increase stand flammability by creating ladder fuels. Some of the work elements that have primary objectives covered by other

activity type and components are not detailed here (e.g., reforestation; thinning of forested stands; prescribed fire).

**Aerial Survey and Application of Insecticides and Pesticides** - Aerial surveys are used to determine status, extent, and intensity of defoliation or mortality from insects, diseases, or other agents (i.e. bear damage). .

*Fixed Wing/Helicopter Flights and Application < 1500 feet* – Special *surveys* that require close inspection by helicopters are typically conducted 100 to 500 feet above treetops. Fixed wing aircraft or helicopters flying within 50 feet of the treetops and in swaths of about 150 feet *apply insecticide*. Only Environmental Protection Agency (EPA) approved insecticides are used and all applications follow label directions and precautions. Mitigating actions required by an Environmental Assessment (NEPA document), or Record of Decision (ROD), are included in the contract. Bulk tankers transport insecticide over forest roads. Water, if needed, is pumped from rivers or streams (see the Prescribed Fire Type for water drafting and water pumping). Either a fixed wing aircraft or helicopter *dispenses fertilizer pellets* from a height close to the treetops in narrow swaths.

*Fixed Wing/Helicopter Flights and Application > 1500 feet* - Fixed wing flights are typically conducted about 1,500 feet above treetops, traversing the area in a grid with 4-mile wide swaths, or by contour flying in deeply dissected terrain.

## **Fertilization**

*Hand Application of N-Frells* - Fertilization can enhance stand vigor and promote resistance to insect and disease-related mortality, and subsequent risk of fire. Nitrogenous compounds in the form of pellets (*N Pellets*) or frells (*N Frells*) can be applied by hand using a hand-crank fertilizer spreader.

## **Ground Applications of Pesticides**

*Backpack Spraying or Inoculation of Individual Trees with Insecticides* – Insecticide is applied to protect individual high-value trees using backpack or hydraulic sprayers. Only EPA registered insecticides are used and all applications follow label directions and precautions. Mitigating actions required by the NEPA document or Record of Decision (ROD), are included in the contract. Insecticide in small quantities (less than 50 gallons) is transported by small truck to the treatment sites. Occasionally, implants of a systemic insecticide are placed by hand into individual trees.

*Borax Treatment of Freshly Cut Stumps* - To prevent the spread of annosus root disease, large freshly cut stumps are covered with a thin film of borax powder to prevent germination of *heterobasidion annosum* spores. Borax may be applied manually or mechanically, using an attachment to the felling equipment.

**Ground Surveys** - *Walking Surveys* are used to determine status of insects and diseases, or to “hazard rate” stands to identify those susceptible to insects or diseases before and after fire. A

survey of stands is conducted in a manner similar to a forest inventory. One or two people traverse stands and take non-destructive measurements of the vegetation and site. Occasionally roots or boles are chopped to detect or verify insects or diseases. Some surveys establish semi-permanent plots. These surveys are conducted where areas are fully accessible on foot. See the **Access and Equipment Maintenance Activity Type** for additional information.

**Manual and Mechanical Treatments** – Manual and mechanical treatments reduce stand susceptibility to insect and disease-caused mortality and consequently reduce fire risk. Treatments reduce stand density, remove infested trees, remove trees at high risk of becoming infected (for example scorched trees), alter stand structure, or convert stands to less susceptible species. Slash disposal prevents bark beetle build-up in downed material. For treatment to be effective against bark beetles, most of the material larger than about 4” in diameter must be physically removed from the site, debarked, cut into smaller pieces, chipped, or burned, before beetle flight.

### **Manual Treatments**

*Thin, Select Against Species/Conditions* – Manually thinning involves a crew using chainsaws to cut undesirable trees close to the ground. Susceptible species and trees infected with dwarf mistletoe, western gall rust, or other insects or diseases are selected against. See the **Mechanical Treatments Activity Type** for additional information related to thinning.

*Burning Infested Trees* - Individually infested trees can be burned in place. Slash can also be burned in place, or pushed into piles with large rubber-tired or tracked tractors, and burned (*machine pile and burning*). See **Mechanical Treatments and Prescribed Fire Activity Types** for additional work elements used to accomplish these objectives.

*Topping or Otherwise Killing and Removing Infested Trees* - Individual trees can be burned in place, or the tops may be removed to kill the tree. Treetops are removed with a chain saw, or by setting an explosive charge below the live crown. Girdling, cutting off the bark and cambium in a strip 4 inches wide all the way around the tree, is less reliable.

*Slash Disposal, Lop and Scatter, Pile or Cover Hand Pile and Burn* - Disposing of slash helps prevent bark beetle build-up in downed material. Manual slash disposal requires cutting slash into smaller pieces and scattering them on the ground (*lop and scatter*), or putting the pieces in piles not more than approximately 6 feet high. Piles may be placed in the sun and covered with transparent plastic to kill any bark beetles (*pile and cover*), or burned (*pile and burn*). Slash can also be broadcast burned in place. See the **Prescribed Fire and Mechanical Treatments Activity Types** for additional work elements used to conduct these activities.

*Pruning* - In some cases, dwarf mistletoe brooms can be pruned from the lower crown to increase tree vigor and/or reduce a safety hazard. Pruning also reduces white pine blister rust infection and mortality. Pruning is usually done with a chain saw or pole-pruner and pruned branches are lopped and scattered on the ground.

## **Mechanical Treatments**

*Slash Disposal Debark/Chip/Fragment, Machine Pile, and Burn* - Disposing of slash helps prevent bark beetle build-up in downed material. For treatments to be effective against bark beetle outbreaks, most of the material must be reduced to less than about 4 inches in diameter. Slash can be chipped and spread around the site. Slash can also be burned in place, or pushed into piles with large rubber-tired or tracked tractors, and burned. Large logs can be debarked by machine. See **Prescribed Fire and Mechanical Treatments Activity Types** for additional work elements used to conduct these activities

*Young Stand Destruction, Chaining, Roller Chopping* – Where a young stand has become heavily infected and stand management objectives will not be met, stand destruction can be accomplished by chaining, roller chopping, or manual whip felling. Chaining and roller chopping requires the use and transportation of heavy equipment. *Chaining* requires two bulldozers moving together over the stand with a heavy chain stretched between them; the chain knocks down and pulls up the young trees. *Roller chopping* is done with a bulldozer pulling a large rolling drum over the stand. The drum has protruding flanges to aid in cutting and crushing the young trees. For added weight, the drum is filled with water (often drafted from a stream see **Prescribed Fire Activity Type**) from a water tender or engine, and drained on site. Under freezing conditions, the drums may be filled with antifreeze. Slash may be lopped and scattered or burned in place. Manual whip felling involves crews using chainsaws to cut the infested trees as close to the ground as possible.

*Overstory Removal* – When previous partial cutting has left an overstory heavily infected with dwarf mistletoe, timely overstory removal prevents infestation of the young understory.

Overstory removal can be accomplished mechanically (see the **Mechanical Treatments Activity Type** for additional elements). Felled trees can be removed or left on site with appropriate slash disposal.

*Harvest/Removal of Fire Damaged or Other High Risk Trees* – Fire killed or heavily damaged trees, trees infected with mistletoe, or trees with extensive decay may be a safety hazard to vehicles on roads, to a campsite, parking area, or building. Such trees are typically felled by chainsaw, and subsequently removed or left on site with appropriate slash disposal. See the **Mechanical Treatments Activity Type** for additional work elements associated with removing hazard trees. An old dense, heavily damaged or heavily infested stand may not be capable of meeting management objectives, or it may be a fire risk. Regeneration harvest can return a forest stand to dominance by seral species that are less susceptible to some insects and diseases. Regeneration harvest is designed to completely replace a stand by clearcut, seed tree or shelterwood cut. Seed tree and shelterwood cuts require multiple entries before the old stand is completely removed from the newly regenerated stand. See the **Mechanical Treatments Activity Type** for additional details and work element descriptions.

*Thin, Selecting Against Species/Conditions* - Thinning from below and thinning with selection against certain species or conditions, reduces stand density and alters stand structure and composition. This reduces the stands susceptibility to insects and disease. Mechanical thinning requires the use of heavy equipment and power tools. See the **Mechanical Treatments Activity Type** for additional details and work element descriptions.

**Plant Less-Susceptible Species** – See the **Reforestation Activity Type** for activity components and work elements associated with planting. Many insects and diseases are host specific or preferentially attack certain kinds of trees. The dwarf mistletoes and some bark beetles have limited host ranges. Climax species tend to be more susceptible to root diseases. Planting less-susceptible species can ensure continuous forest vegetation conditions while other tree species are under decline.

**Population Assessment and Trapping** - In some instances, population assessments are conducted prior to the roads being passable because of snow. In these cases, roads must be plowed to gain access to remote areas requiring analyses. For some insects, the placement of bubble caps (see below), may be done over snow. In these situations, roads may need to be plowed or travel with snow machines may be necessary. See the **Access and Equipment Maintenance Activity Type and Reforestation Activity Types** for work elements related to snowplowing and over the snow travel.

*Sampling and Trapping* - Population assessment of defoliators is sometimes done over a large landscape to determine if populations warrant suppression. Larval populations are sampled prior to application of pesticides. This usually consists of clipping 18-inch branch tips and counting larvae. Larvae can also be sampled by beating the lower branches of a crown; this dislodges the larvae onto a canvas where they are counted. For cocoon and/or eggmass sampling, visual observations are made of the lower crown of trees, or lower branches are cut and examined.

Adult populations of defoliating insects are sampled using pheromone-baited traps placed in accessible areas to catch flying males.

**Use of Fire** - Prescribed underburning can accomplish some of the same objectives as thinning from below, thinning with selection against certain species, and young stand destruction. See the **Prescribed Fire Activity Type** for related work elements.

*Pulling Back Duff from Legacy Trees* - Large legacy trees may be protected from bark beetle attack by removing competing vegetation and pulling back duff from the base of the tree. Thick duff at the base of large trees is pulled away by hand crews using rakes or shovels. The duff is then redistributed well away from the large trees.

**Use of Pheromones** – Pheromone treatments may be used to collect massive numbers of beetles in baited traps or trap trees, or to disrupt the behavior of beetles to prevent their infestation of other susceptible stands.

*Anti-aggregate Bubble Caps* - Anti-aggregate pheromones are used to disrupt the behavior of beetles to prevent infesting susceptible stands. Pheromone bubble caps (packets containing an EPA-registered pheromone) are stapled to trees in a 10 x 10 meter grid pattern over the treatment area. After the flight period, the bubble caps are removed from the trees.

*Trap Tree Baiting and Removal*- Attracting and collecting massive numbers of beetles in pheromones-baited “trap trees” can reduce bark beetle populations. Trap trees are removed from the area before the next beetle flight period. When removing trap trees is infeasible, pheromone-baited traps might be effective in some instances.

### **ACTIVITY TYPE: Forest Products**

Activities include collection and gathering of products other than those related to mineral or saw-timber removal operations. All activities require collection permits whether for personal or commercial uses. Activity levels vary from minimal, to potentially disturbing, depending on the density and collection locations across a unit. Activities may require the use of heavy equipment and power tools as well as off-road travel and/or increased access to previously un-disturbed sites. These activities will not require new road construction or reconstruction, but in rare circumstances, opening a closed road may be needed. Work elements described in other activity types such as **Mechanical Treatments or Defensible Space** may be implemented during collection activities such as firewood collection.

To manage activities of potentially high densities of people and minimize resource damage, appropriate campsites and sanitation facilities must be provided. Soil and plant compaction, and/or road closure violations may occur. Campers located near water sources should be kept from having an impact on riparian areas, fish and efforts made to minimize potential effects to listed species such as bald eagles. Proper camp location, law enforcement involvement, and education should help avoid any adverse effects.

## ACTIVITY TYPES AND WORK COMPONENTS

### Firewood Collection

*Collect Firewood from Already Downed Sources (e.g., hazard tree removal and road maintenance)* - Firewood collection may require the use of heavy equipment, and/or access and hauling activities may pose concerns. Firewood collection for both personal and commercial use will require a permit; commercial operations are managed, but personal collection may or may not be managed depending on the geographic area. Personal firewood permits allow for the collection of ten cords of wood per year and per person. These may be sold under one or separate permits. The number of cords of wood allowed for collection under a commercial permit will vary by administering unit. The amount of woody material taken from a site should not exceed amounts required by the administering units' standards and guidelines for dead and down material. See the **Access and Equipment Maintenance and Roads and Road Maintenance Activity Types** for additional information.

**Fruits, Berries and Nut Harvest – Hand Picking and Raking of Edible Berries** - Eventually there will be an increase in the availability of fruits, berries, and nuts depending upon the site, habitat type, and extent of a burn. Concerns identified under mushroom harvest relative to campsites, human densities and potential resource damage apply.

### Greenery Harvest – Total Removal

*Digging of Species for Complete Removal* – Collection of boughs, ferns, or any other plants used in ornamental commodities is allowed under permit for personal and commercial operators. No significant increase in any additional management is expected. In burned areas, no harvest is expected.

**Moss Harvesting - Moss Removal** – Moss collection is not expected to increase above normal levels or to occur in burned areas.

**Mushroom Harvesting - Removal of Fungi** – Large numbers of people can be expected, under permit, to personally or commercially harvest mushrooms such as morels, *morchella esculenta* in the black area projects. Morels come in after disturbance and usually last three to four years each spring for approximately a three-week period.

*Raking of Soil Substrate/Mycelium* - Harvest techniques do not require raking for detection or collection therefore, soil substrate disturbance will be minimal.

**Tree and Shrub Removal - Complete or Partial Removal of Trees or Shrubs** - Collection of whole or partial plant parts used in ornamental commodities (i.e., scorched bark, root wads, picture frames, fence posts, landscape design) is allowed under permit for personal and commercial operators in areas previously impacted by wildland fires. See the **Mechanical Treatments Activity Type** for additional information.

**Public Access - *Public Access* - See the Access and Equipment Maintenance Activity Type for implementation information.**

### **ACTIVITY TYPE: Recreational Facilities and Operations**

This activity includes obliteration, rehabilitation, reconstruction, and new construction of recreation facilities. Work elements will vary widely in response to the effects a recreation site may receive fire, or suppression activities. The acquisition of materials (i.e. gravel, riprap, boulders, borrow) for construction or reconstruction may occur on lands not adjacent to the recreation facility, and impacts may be associated with the operations at these material sources. Activities associated with recreation facilities and operations may be needed where fire may have caused damage, during suppression activities, or for the development of defensible space (see the **Defensible Space Activity Type** for information) around the facility. See the **Access and Equipment Maintenance Activity Type** for associated activities.

#### **ACTIVITY COMPONENTS AND WORK ELEMENTS**

##### **Existing Facilities Developed and Dispersed**

*Install Site Furniture* – Installing site furniture such as tables and grills requires some ground disturbance, vegetation removal, and excavation for sinking table legs, fire rings, or pedestal grill supports. Ground hardening around site furniture can be done with gravel, asphalt, or concrete.

*Remove Trees and Ground Vegetation, Blade to Create Smooth Surface, Apply Gravel, Asphalt or Concrete to Harden Site* – Removing trees, shrubs and other site vegetation may be accomplished with a variety of methods. See the **Mechanical Treatments and Reforestation Activity Types** for additional information associated with these activities. Blading and smoothing the surface (or adding topsoil) would occur before applying gravel, asphalt, or concrete. Materials would be hauled to the site and applied by the use of heavy equipment and hand tools.

**Install/Remove Toilets** - Toilet installation may require clearing trees and other vegetation, excavation for vaults, backfill around vaults, and transport and installation of buildings. Large cranes may be necessary for building placement. The ground around the structure may need to be re-contoured, and topsoil added to prepare the area for seeding or planting.

*Harden Entry to Building* – An area in front of buildings is typically hardened with gravel, asphalt, or concrete to withstand expected wear around the building.

*Remove Trees, Excavate, and Construct Building* – Removing trees, shrubs and other site vegetation may be accomplished by variety of methods. Tools such chainsaws, weed whackers, or other power tools and equipment may be used. Slash would be piled for subsequent removal. See the **Mechanical Treatments and Reforestation Activity Types** for additional information associated with these activities. Excavation of an area would be required to place the foundation and vault. This can be done with a small backhoe and/or other digging device. The building may be hauled to the site or constructed at the site.



*Collapse Building into Vaults or Haul Structures Off Site* – Components such as toilet vaults and foundations are sometimes capped and buried at the site. The site is then rehabilitated. The old structure may also be properly contained, and hauled away from the site for disposal. These activities require the use of heavy machinery, and vehicles for hauling such as dump trucks or trucks with trailers.

**Installation of Other Site Amenities** - Other site amenities such as interpretive signs, garbage containers, water developments, or other structures may be installed. As with installing a toilet, some of this work will require excavation, clearing vegetation, and rehabilitation of the area with grading and leveling, for the application of gravel, asphalt, or concrete, if needed. Culverts, ditches, and other types of drainage devices may also need to be installed.

*Remove Trees and Vegetation, Excavate Backfill* - These activities generally require the use of power tools and other mechanized machinery, depending on the location and magnitude of the job. Vegetation clearing can be done with hand tools, small dozers, backhoes, brush whackers, or any number of other tools appropriate for the work.

**Obliteration/Rehabilitation of Recreation Sites** - Obliteration or rehabilitation may be needed for developed or dispersed sites, and this may affect an entire recreation facility (campground, picnic area or trailhead), or simply occur within a portion of the developed site. In some cases, re-locating the facilities may be necessary. New structures are then placed in a different location. Rehabilitation may also involve site expansion or updating old facilities to meet modern needs. For example, a space previously designed to occupy a sedan may be upgraded to allow parking for a recreational vehicle (RV); or a single family camping spot may be expanded to accommodate group camping. Rehabilitation is common where resource concerns warrant action such as moving campsites away from river banks/riparian areas, and hardening roads and/or spurs will help reduce sedimentation.

*Remove any Existing Site Furniture* – Rehabilitation may be complete or partial, and include permanent removal of damaged or old site components, or replacement with new amenities. Removal of facility components such as toilet buildings, tables, grills, fire rings, fire hydrants, and signs may be necessary.

*Install Barriers (Boulders, Fencing, Signs, etc)* - Installing these features depends on the type of fence (free-standing verses, post/pole) and the ground disturbance needed for post installation. Other than where posts are placed, ground vegetation can remain in tact. Individual tree removal may be necessary, however, except in places of extreme dense forest, tree removal can usually be avoided. Boulders may be placed as barriers and are usually attained from public lands, close to the facility. Heavy equipment is necessary for digging up native boulders, transporting, and placing them in the developed site. Placement includes digging a hole (typically 1-2 feet deep) and placing the boulder in it. Backfill may be necessary.

*Rip Surface, Re-contour, Topsoil, Seed, and/or Mulch* - These activities may be implemented on roads and/or spurs, trailheads, parking areas and other compacted and/or surfaced areas. Some sites may need surface ripping, re-contouring or scarification for seedbed preparation. Native seeds or seedlings may be used or an annual fast rooting species to stabilize the site until native

vegetation re-establishes. Where seeds are slow to establish and native forbs and grasses have long-lived roots systems, the introduction of root-rich soil from the local area helps re-establishing ground cover. In some areas, topsoil may be hauled to the site and spread before seeding. See **Watershed Restoration, Range Infrastructure (rangeland restoration), and Reforestation Activity Types** for information associated with re-seeding and planting. Mulch application helps prevent soil erosion, retain soil moisture, and protect seeds and seedlings from extreme temperature changes, wind, or damage from trampling.

## **Recreation Site Maintenance**

*Road Grading and Spot Graveling* - This may occur in both dispersed and developed sites and on roads and road spurs. Spot graveling and road grading are described in detail under the **Roads and Road Maintenance Activity Type**.

## **Water Development**

*Excavate Hole, Pump Installation* – Installing a water development may require the development of a well. The well is generally capped with a hand pump and concrete pad (typically 5' radius) laid; distribution line is then placed to various locations within the developed site.

*Trenching for Distribution Line* – Distribution line is placed in trenches approximately 30 inches to 6 feet deep; disturbance widths will vary from 2 to 3 feet. The trench is filled with gravel (or loose rock), pipe is placed, and the trench is backfilled. The surface is then leveled, top soiled and seeded. Trenching typically requires the use of hand and power tools as well as heavy equipment.

See the **Range Infrastructure (water developments) Activity Type** for additional work activities associated with water developments.

## **Additional Information on Recreational Facilities**

**Dispersed camping and boating areas** are typically accessed from two-track or narrow graveled roads. Dispersed camping sites are typically undeveloped (i.e., absence of tables or grills), and user-constructed rock fire circles are often present. Sites typically have native surfacing only with sparse vegetation and compacted soils from concentrated use. Many dispersed sites occur near water, often within riparian zones found around lakes and along streams and rivers. Boating sites (where users launch and remove boats) commonly have user-defined pedestrian trails and user-developed motorized trails that extend directly to the water's edge.

**Developed campgrounds** have defined interior roads and camping spurs, typically surfaced with gravel or asphalt. Each site includes a table and fire ring, sometimes with a pedestal grill, hydrant, and electrical hook-up. Within developed campgrounds, toilet buildings, signage, fee stations, garbage receptacles, and additional water hydrants are present.

**Trailheads** have defined parking areas (usually surfaced with gravel or asphalt), informational signing and/or kiosks, and one or more of the following: corrals, hitch rails, toilet building(s), potable water, water trough, and/or a horse unloading ramp.

**Picnic Sites** generally have parking areas (usually surfaced with gravel or asphalt), picnic tables, and toilet building(s). Sites are managed for day use only and may have interpretive signs, linkages to day-use trails, garbage receptacles, fire rings, pedestal grills, and play areas.

### **ACTIVITY TYPE: Mechanical Treatments**

Work elements are typical of timber harvest operations, however, implementation of certain work elements may be needed for reasons other than timber production. For example, thinning forested areas may be used to reduce fuels in the wildland-urban interface (WUI) and create “defensible space” near human developments or agency administrative sites. Most work elements in this activity type require the use of power tools, heavy equipment, and crews.

### **ACTIVITY COMPONENTS AND WORK ELEMENTS**

**Access and Equipment Maintenance** - See the Access and Equipment Maintenance Activity Type for work elements associated with access and the use of heavy equipment, and mechanized tools

*Dust Abatement* – See the **Roads and Road Maintenance Activity Type** for implementation descriptions of this work component.

*Water Drafting* – See the **Prescribed Fire Activity Type** for implementation descriptions of this work element.

**Harvest Prescriptions/Implementation** - Prescriptions contain rationale for treating forested habitats (land management objective), and identify implementation tactics needed in advance of harvest activity. For assessing potential effects of harvest treatments on certain species, activities include both the description of treatment to be enacted, and actual implementation procedures. Harvest units are marked either as leave or cut trees, or designated by a diameter limit or by a species for harvest in the timber sale contract.

*Regeneration Harvest: Clearcutting, Seed Tree, and Shelterwood* - Treatments are used to create a forest stand with one or two age classes in an exposed microclimate. Treatments are most suited for seral (shade intolerant) species. Clearcutting removes all trees in a single harvest thereby preparing the site for planting or natural regeneration. Seed tree harvest removes all except a small number of seed trees to provide for regeneration. Shelterwood operations remove most of the trees except those needed to provide shade, and/or seed for the establishing stand. Traditionally, the shelterwood and seed trees that remain are removed once the new stand is established.

It is more common now to leave seed trees, shelterwood trees, and other designated trees as “reserve” trees, to promote forest stand diversity, and meet other resource needs. Reserve trees may comprise 40 % of a forest stand following harvest, occurring in groups or uniformly

throughout the stand. Trees are managed with the developing young stand to produce a two-aged stand. During shelterwood and seed tree harvest treatments, the majority of undesirable small trees are typically slashed so they do not compete with establishing trees.

*Understory/Single Story Treatments: Thinning* – Thinning or partial harvest is typically used in even-aged forest stands. Trees are removed from lower-crown classes leaving upper-story classes intact. Sometimes, a single story treatment may also include removing larger trees when they overtopped, malformed, or otherwise are undesirable dominants.

*Overstory Treatments: Overstory Removal, Partial Overstory Removal, Sanitation* - In uneven-aged forest stands, all or some portion of the larger, dominant trees in the overstory may be removed leaving the understory trees intact. This is referred to as partial or complete overstory removal. This can be accomplished selective tree and group harvest procedures. *Sanitation* - Sanitation cutting removes dead, diseased and damaged trees, and/or those live trees susceptible to the actual or anticipated spread of pests and/or pathogens. This treatment is used to promote forest growth and health. The liberation method removes trees that are overtopping young trees in the sapling stage. The improvement method is similar to commercial thinning where less desirable trees are removed to improve stand composition and quality. A timber sale contract refers to these systems as commercial thin and overstory removals.

*Dead Trees: Salvage and Hazard Tree Removal* – Salvaging dead and dying trees or deteriorating stands typically occurs before the wood becomes economically unfeasible to harvest. When all or nearly all of the trees in a stand are dead, a regeneration system is prescribed. When a small portion of the stand is dead, a salvage operation is prescribed that leaves residual live trees. Salvage operations are the most common treatments used in areas to remove dying and damaged trees following fire, insect or pathogen outbreaks, or weather related events such as winterkill. *Hazard Tree Removal* - Hazard trees occur in a variety of situations and are created from several sources including but not limited to fire, insects, or pathogens, age or man-caused injuries. Hazard trees are removed when they pose a risk to campsites, administrative sites, along roadways or other areas where the trees pose a danger to the public. Hazard trees are also those identified within a work site that pose a danger to the health and welfare of people working at the site. These trees may be obstacles to safely working equipment, or they may be snags or weakened trees with the potential to topple during work operations. Such trees are typically felled by chainsaw, and subsequently removed or left on site with appropriate slash disposal. Removing hazard trees following fires or after insect and/or disease outbreaks is often done through the timber sale process or removed by contract.

*Selection Harvest (All Stand Layers)* - Selection harvest is used to “regenerate”, create and retain at least three distinct age classes. Several harvest entries are made over the rotation period of the stand. Traditionally, treatments have been designed to maximize timber yield and establish a new crop of trees with an irregular constitution (species and structure). Selection treatments may be designed to remove individually dispersed, and/or groups of trees. Individual tree selection is limited to the removal of shade tolerant species and no distinct openings are created.

Forest stand opening are established where groups of trees have been removed. Group selection harvesting can be used on any forest type. The size of the opening is dependent on whether the

primary species to regenerate is seral (shade intolerant or semi-shade tolerant) or climax (shade tolerant). For example, openings can range from ¼ to 4 acres. New trees establish in the openings and this promotes the development and maintenance of a structurally diverse forest stand. This type of treatment is suitable for shade intolerant or shade intolerant species. Harvest entries may occur at intervals of twenty or thirty years, or longer depending on the rotation life of the stand.

**Skidding/Yarding, Hauling and Loading** – During timber harvest, skidding or yarding, and hauling and loading are operations used to get the timber product from the stump to the mill or other destination.

*Skidding/Yarding* – Skidding is a loose term used to describe the process of sliding logs from the stump to the log deck or landing site. During this operation, logs are moved more or less wholly along the ground. Similarly, yarding is the initial haul of the cut tree to a collecting point, (i.e. transporting timber from stump to a yard or landing).

*Hauling* – This is a general term for the transport of loads from one point to another, (e.g., logs from stump to landing or from landing to mill or shipping point). Logs are loaded onto a logging truck and transported on a main road designated as the haul road. Log truck travel along haul routes may have short-term impacts in the area by generating dust or creating disturbances.

**Killing Sub-merchantable Trees** – See activity component “tree felling”, and the **Prescribed Fire Activity Type** for implementation of this activity component.

## **Landings and Skid Trails**

*Construction and Location* – A landing is a place where timber is assembled for further transport. Landings are generally “constructed” by clearing away existing vegetation (trees and brush), however, no soil is removed or plowed up. Logging activities often center around landings and most heavy equipment is used there. Landings must be constructed to complement the yarding system; comply with safety codes and other environmental standards; accommodate the size and type of machinery needed; and, the amount of material to be yarded.

Skid trails are prepared where soil disturbance will be minimal when logs are dragged or hauled on a forwarder. A skid trail may be a designated road or trail leading from stump to landing.

**Logging Systems** – Mechanical method of getting the tree/log from the harvest unit to the landing. The logging system used for stand treatment depends on harvest objectives, terrain, and concerns for other resources.

*Ground Based* – Ground based logging systems use tractors, feller-bunchers, forwarders, and some types of cable systems. No logging operation is done with the use of helicopters or balloons.

*Helicopter* – An aerial yarding operation that lifts and flies logs to a landing, having very minimal, if any, soil disturbance. Aerial operations are used where access is limited, yarding distances are one-half mile or less, or other resource concerns must be met.

*High Lead* – Powered cable logging in which main-line blocks are fastened high on a spar tree or equivalent, to enable the front end of logs to be lifted clear of the ground. Generally these systems are powered by a 3-drum power-unit carrying main haul-back and straw lines. This logging system requires the use of heavy equipment, however, ground disturbance is low.

*Skyline* – Powered cable logging where a heavy cable, “the skyline”, is stretched between two spar-trees (or their equivalents): the head-spar, close to the landing and power unit, and the tail-spar. Spar trees function as an overhead track for a load-carrying trolley, or skyline carriage. The carriage traverses along the skyline under the control of a main-line and a haul-back line. Under some operations, logs travel clear of the ground for minimal impacts on soils. Most skyline operations do not provide for full suspension and therefore the logs would be trailed on the ground

### **Piling of Tops**

*At Landing* – If a cutting unit is to be tree-length yarded, manufacturing on the landing requires piling of tops and limbs, for later treatment by burning or some other means.

*Within Unit* – If cut trees are manufactured within harvest units, tops and limbs are piled in the unit for treatments such as removal, burning, or some other means.

### **Reducing Soil Compaction**

*Sub-soiling* – Requires the use of a machine attached to a small bulldozer to dig into the ground and uplift soil to reduce subsoil compaction, caused by logging or other mechanized equipment. Provides soil better suited for tree establishment and water penetration.

**Refueling** - See the **Access and Equipment Maintenance Activity Type** for implementation descriptions.

**Rehabilitation and Removal of Excess Vegetation and Slash** - After harvest, fire, or other disturbance, treatments are needed to prepare the site for regeneration and reduce high fuel loads. Operations should be conducted in a manner to minimize topsoil disturbance, and maintain the desired level of woody debris on the site. Alternate machines include:

*Furrowing* - A dozer with a blade at an angle is used to create a furrow oriented on the horizontal. Furrowing is done to accomplish scarification on steeper slopes, and used to minimize erosion.

*Patch Scarification, Mechanically or by Hand* - Scarification is achieved with attachments to dozers which scrape the ground surface to expose mineral soil at specified distances to create

planting spots. Generally, patch scarification is only used where competing vegetation is very dense.

*Dozer Scarification* - Generally, a bulldozer with a brush blade or similar attachment rips topsoil pulling out bunch grasses or similar competing vegetation in a pattern distributed over 20 to 40% unit.

*Dozer Piling* - If residual woody debris is a fire hazard, the dozer will pile excess woody debris throughout the unit for later burning.

*Grapple Piling* - The grapple piler lifts fuels up and lays it in a pile. The machine's head can also spot scarify. Less topsoil is disturbed in grapple piling, as opposed to dozer piling.

*Hand Piling* – Excess slash from a harvest operation may be piled to reduce fuels in limited areas, such as Riparian Habitat Conservation Areas (RCHA). This process does not scarify and no soil disturbance occurs.

**Road Construction** – See the **Roads and Road Maintenance Activity Type** for implementation descriptions.

**Road Maintenance** - See the **Roads and Road Maintenance Activity Type** for implementation descriptions.

### **Skid Trail/Landing Rehabilitation**

*Waterbars* – Shallow channels (cross-drains) or raised barriers (e.g., a ridge of packed earth or a thin pole), are laid diagonally across the road surface to lead water (particularly storm water). This may eliminate or reduce potential sediment from reaching streams, wet meadows or other moist areas of areas of concern.

### **Tree Felling**

*Hand* – Standing trees are primarily cut down with hand tools such as a chainsaw. In wilderness areas, however, a cross cut saw is used.

*Mechanical* – This involves cutting down a tree with a chain saw and/or feller-buncher. A feller-buncher is a tracked vehicle with a boom and chainsaw or clippers attached to the end of the boom for cutting trees. A feller-buncher lays down a slash mat on which to operate for minimal soil disturbance. Skidding equipment also moves over slash mats built by the feller-buncher to reduce soil movement.

**Additional Information for Harvest Treatments** – These are not “stand alone” work components or work elements. They are included here to help further describe the harvest prescriptions described above. These are common treatments used for the management of forested areas for timber productions.

Intermediate/Commercial Treatments - Intermediate harvest (or sometimes known as commercial thinning) is the harvest of trees in an immature stand to reduce tree numbers, and/or select for favored tree qualities. Trees are generally removed in a dispersed manner and regeneration is not the goal. These treatments promote the growth and vigor of the remaining trees, or may be used to alter the species composition of the stand. Sanitation harvest may be the goal of these operations as well. A manageable stand remains following harvest. The following harvest treatments are generally considered intermediate operations. Post and pole sales, (the harvest of trees from 4 – 7 inches at diameter breast height), may fall under this category. These treatments are most common in lodgepole pine stands and where the demand is high for fence material and other uses.

Pre-commercial Thinning/Commercial and Non-Commercial – “Pre-commercial thinning” generally refers to the harvest of trees ranging in diameter breast height from 1 – 4 inches. Generally, the purpose of this activity is to reduce competition among the trees in the target forest stand. Tree densities in pre-commercially thinned stands will vary from 150 to 400 trees per acre; this depends on species growth patterns and management objectives. Release thinning is similar, although generally involves the felling of trees overtopping young regeneration in a non-commercial operation. Pre-commercial thinning is typically conducted with a service contract. During periods of poor market conditions or treatments involving species with little or no market value, trees larger than 4 inches in diameter may be cut and not sold.

### **ACTIVITY TYPE: Watershed Restoration**

Watershed restoration activities are intended to repair and monitor fire impacts and restoration treatment effectiveness. Work activities include: control of hillslope or channel erosion, watershed stability enhancement, and monitoring of fire impacts and effectiveness of restoration treatments. Treatments are primarily designed to reduce soil loss in burned watersheds, and minimize adverse impacts on water quality and aquatic and terrestrial habitats. Techniques described here can be used in watersheds with forest, shrub, and grassland habitats to control both storm runoff and erosion.

Mobilizing crews and equipment transportation would typically occur on existing roads. Equipment may require off-road travel to access work areas. Remote work sites may require crew camping near work areas. See the **Access and Equipment Maintenance** and **Roads and Road Restoration Activity Type** for activity components and work elements needed to implement watershed restoration treatments.

### **ACTIVITY COMPONENTS AND WORK ELEMENTS**

**Hillslope Erosion Control** – Erosion control treatments are implemented to reduce or slow surface runoff and soil erosion. Some are specifically designed to reduce soil compaction, increase water infiltration, and recover site productivity. Work elements used in upland areas or riparian areas include *trenching, terracing, slope ripping or sub-soiling*. Other activities include installing *gully check structures* such as *logs, hay bales* and/or silt fences.

Some treatments, such as *contour felling* and *straw wattle installation* (may include straw bales), would be done by hand crews. Activities designed to reduce soil compaction, such as *road or*



*landing ripping, subsoiling, or scarifying* is done with heavy equipment, but hand labor may be used in certain situations. These treatments increase water infiltration and prepare a site for subsequent seeding.

*Erosion Control Mulch or Blankets* - Applying mulch helps prevent soil erosion, retain soil moisture, and protect seeds and seedlings from extreme temperature changes, wind, or damage from trampling. Mulch can be applied by manual or mechanical means depending on the need.

## **In-Channel Erosion Control**

*Log, Root Wad or Willow Bundle Revetments* - These are installed as gradient control measures.

*Reshape Streambanks and Incised Channels* - Treatments designed to reduce streambank erosion and enhance channel stability may be implemented in active channels and floodplains.

*Lay Back Vertical Banks* – Laying back the bank is needed when the bank slope is too vertical and sloughs into the stream. These procedures help reduce the bank's vertical slope, thus reducing erosion and channel undercutting.

*Install Barbs* - Installing barbs also helps to reshape banks and incised channels. Barbs are generally logs anchored to the streambanks. They extend into the stream channel and slow down or redirect water flow helping to create such features as pools.

*Structural Bank Controls (riprap)* - Structural bank control or shaping can be treated with the placement of riprap.

**Revegetation** - Revegetation treatments are designed to establish ground cover, improve infiltration, and restore site productivity. These activities may be implemented on upland slopes, riparian areas and along streambanks.

*Seeding – Aerial or Hand Application* - Seeding techniques include hand and aerial broadcast. A Hanson dribble may be used for seeding rangelands. See the **Rangeland Infrastructure Activity Type (rangeland restoration)**, for additional information related to seeding.

*Site Prep Surface Scarification, Tilling, Ripping* – These activities are implemented for seedbed preparation. See the **Reforestation and Range Infrastructure (rangeland restoration), Activity Types** for further information related to these activities.

*Planting (Upland and Riparian)* - Riparian and upland areas (with grasses, forbs, shrubs and/or trees) may be planted with transplanted nursery stock and/or local plant materials. Plantings may be done by hand or with machinery to plant or move clumps of local plant materials. See the **Reforestation Activity Type** for additional information related to planting.

Normally, species used for seeding or seedlings are native to the area, however, non-persistent, non-native species may be used where objectives require rapid ground cover establishment.

*Mulch Application* - Applying mulch helps prevent soil erosion, retain soil moisture, and protect seeds and seedlings from extreme temperature changes, wind, or damage from trampling. Mulch can be applied by manual or mechanical means depending on the need.

*Hanson Dibble* – This non-mechanized tool is used by an individual to plant tree and shrub seedlings in all types of soils and on all slopes.

## **Road Obliteration**

Road obliteration is described under the **Roads and Road Maintenance Activity Type**. Obliteration treatments for watershed restoration purposes include recontouring. Full recontouring means replacement of sidecast, or replacement material back onto the roadcut to restore the original slope angle. Recontouring normally requires heavy equipment such as excavators.

## **Sediment Control**

Structures (e.g., *instream log structures*) are designed to detain, control, or remove increased sediment in highly impacted burned watersheds. Rebuilding and *maintaining instream structures* helps protect and *maintain instream basins (impoundments)*. Structures are constructed and placed by crews using equipment and/or hand crews. Maintaining structures requires sediment removal and disposal by equipment and/or hand crews depending on size and location of structures.

## **Watershed Monitoring**

Work activities designed to measure vegetation recovery, soil condition (*erosion plots*), stream channel condition and water quality may be needed to monitor watershed conditions, and recovery following environmental events such as fire. Monitoring activities installation of *stream gages* to measure flow, collecting *instream water* to test for *water quality and sediment loads*, taking *manual instream measurements*, and establishing *monument plots*.

## **ACTIVITY TYPE: TES Habitat Restoration**

These projects cover a wide variety of habitat restoration and enhancement activities for wildlife, fisheries, and plant restoration. Activity components with primary objectives covered by other activity components are not detailed here. These are as follows: road re-location, road decommissioning, road maintenance, and road restoration/storm-proofing; thinning of forested stands; prescribed fire; and watershed restoration techniques such as in-channel erosion control structures.

Heavy equipment, including helicopter operations, and the use of power tools are often needed for many instream and aquatic restoration projects and their operation. Access sites and provisions must be made to haul and use heavy machinery. All of these activities would require the presence of crews at a site for any given time required to accomplish the work. Most

instream restoration activities and some streamside activities would create additional temporary sediment loading.

## ACTIVITY COMPONENTS AND WORK ELEMENTS

### Instream Restoration

*Helicopter Operations* – See the **Prescribed Fire Activity Type** for activity components and work elements need to carry out these operations.

*Hilti Drill Operation* – This drill is used to install instream structures.

*Mulching for Erosion Control* – Localized mulching may be used at disturbed sites, and larger areas of erosion control may be needed if there are large areas of bare soil (e.g., as a result of major channel reconstruction or bank disturbance). See the **Watershed Restoration Activity Type** for activity components and work elements needed to carry out these activities.

*Placement of Boulders or Large Woody Material* - See the **Watershed Restoration Activity Type** for activity components and work elements need to carry out these operations.

*Power Saw Operation* – See the **Mechanical Treatments and Access and Equipment Maintenance Activity Types** for additional information.

*Seeding For Erosion Control* – See the **Range Infrastructure Activity Type** (rangeland restoration) for activity components and work elements needed to carry out these operations.

### Meadow Restoration

*Fence Construction* – See the **Range Infrastructure Activity Type** for activity components and work elements needed to construct fences.

*Mowing* - Tractors with mowing implements may be used to mow vegetation along roadsides, and in rangelands with dense shrubs or grasses. Although mowing may not remove roots, it helps eliminate undesired plant species by giving desired plants a competitive advantage.

### Prescribed Fire

See the **Prescribed Fire Activity Type** for activity components and work elements used to restore habitat with prescribed fire.

**Riparian Improvement** – The objectives of riparian restoration are to provide vegetative cover/protect soils, provide wildlife habitat/forage/browse, reduce stream temperatures, provide bank shade/cover, and improve local site hydrologic characteristics (e.g. water table depths).

Typical work elements include planting *native shrub and tree seedlings*, *tall tree planting*, and *forb/grass seeding*. Native plant sources are desired and are usually used, but in circumstances where soil profiles are highly modified, non-native plants may be used. Typical implementation

consists of hand planting, localized site preparation, use of power tools, and sometimes machinery for seed drilling/tall tree planting. See the **Range Infrastructure and Restoration Activity Types** for activity components and work elements used to re-seed and replant areas.

## **Snag Creation**

*Tree Climbing* – See the Reforestation Activity Type for information associated with climbing trees.

*Inoculation* – See the Insect Suppression Activity Type for information associated with inoculating trees.

*Girdling Trees* – Trees are girdled by carving a ring around the tree bole such that the cambium function is interrupted.

*Tree Topping* – See the **Insect Suppression Activity Type** for information associated with topping trees.

## **Brush Pile Construction**

*Mechanical Equipment/Heavy Machinery* – See the **Access and Equipment Maintenance Activity Type** activity component and work element descriptions.

*Tree Felling (power saw)* – See the **Mechanical Treatments Activity Type** for work elements related to tree felling.

*Tree Felling (hand tools)* - See the **Mechanical Treatments Activity Type** for work elements related to tree felling.

**Contour Felling** – See the **Mechanical Treatments** and **Watershed Restoration Activity Types** for work elements related to contour felling.

## **Exclosure Construction and Maintenance**

*Light Mechanical Tool Operation* - See the **Mechanical Treatments Activity Types** for descriptions.

*Power Tools* – See the **Mechanical Treatments Activity Types** for descriptions.

**Fish Population Recovery/Enhancement** - Improving and protecting fish habitat is part of the fisheries programs of most administrative units. When areas have been burned, work may be required to repair structures that have been damaged or destroyed and protective measures may need to be taken to prevent further damage to fisheries habitats.

*Fish Barrier Installation or Removal* - The addition of large woody material and placement of instream boulders may be needed for cover, channel complexity, bedload collection and sorting

(e.g., improve spawning habitat). Replacement and/or upgrading of existing culverts may be needed to provide fish passage and for estimated 100-year flood events. In some cases, the reduction of instream wood loading is required to allow for fish passage, or the installation of barriers to prevent movement of undesired non-native fish may be pertinent.

*Exotic Species Removal Trapping/Rotenone* - Exotic fish species may be removed by trapping or the chemical rotenone.

**Interpretation/Conservation Education** - Many projects have proposed a component that interprets the ecological recovery of severely burned areas. Work components include *signing*, and may include *viewpoint and trail access*, as well as associated *parking and restrooms* (the infrastructure development). Generally, these actions will be adjacent to already developed roads. See the **Recreation Facilities and Operation, Access and Equipment Maintenance, and Trail and Trail Maintenance Activity Types** work elements used to conduct these activities.

### **Monitoring Fish and Wildlife**

*Fisheries Habitat Monitoring*- Monitoring for fish may involve snorkeling, and underwater video, channel condition surveys, fish habitat surveys, telemetry, electroshocking, and redd counts.

*Wildlife Habitat Monitoring* - Wildlife monitoring may include aerial counts, direct observation, denning/nesting surveys, telemetry, bait stations, camera stations, and use of snowmobiles. Plant monitoring may include direct collection, and establishment of study plots/transects (possibly marked by fencing/exclosure).

**Quarry Restoration** – See the **Abandoned Mine Restoration Activity Type**.

*Waste Storage* – Quarry restoration may include the stockpiling or storage of waste materials from the site. It may require hand tools and/or large machinery, depending on the size of the quarry.

*Seeding* – See the **Range Infrastructure Activity Type** for information on seeding practices.

**Road Decommissioning/Obliteration** – See the **Roads and Road Maintenance Activity Type**.

**Spring Restoration and Repair** – See the **Range Infrastructure Activity Type** for work elements used to implement these activities.

**Thinning** – See the **Mechanical Treatments Activity Type** for work elements used to implement thinning treatments.

**Water Source Construction** - See the **Range Infrastructure Activity Type** for work elements used to implement these activities.

**Aspen Restoration** – See the **Reforestation, Prescribed Fire and Rangeland Infrastructure Activity Types** for activity components and work elements used to implement aspen restoration.

*Mechanical Root Shearing* – Mechanical root shearing is used to remove large numbers of trees and stumps over 4 inches in diameter. Most commonly, modified bulldozer blades are used for this activity to sever stumps and standing trees at ground-line. This treatment can clear as much as a 12-foot corridor through debris in one pass.

### **ACTIVITY TYPE: Weeds and Chemical Treatments**

Noxious weed management includes the use of herbicides, and manual, mechanical, biological, and cultural treatments. Rehabilitating a site following treatment is also a part of noxious weed management. Weed treatment may be necessary on rangelands, in timber harvest areas, along roads and road rights-of-way, along trail routes, at dispersed and developed recreation sites, and on other disturbed sites (i.e. fires, flood events). Many treatments are needed during post fire conditions; some are used to reduce the risk and severity of wildland fires. The type of treatment used depends on site characteristics, specific weed species, and management objectives ranging from containment, to control, and eventually to eradication. Containment is to prevent weed spread to beyond the existing infestation perimeter. Control objectives strive to reduce the extent and density of a target weed. Eradication focuses on complete elimination of the weed species including reproductive propagules.

**Treatment Methods** - All vegetation treatments conducted for control of noxious weeds are done in accordance with the corresponding agencies' policies, regulations, and product label requirements. Federal agency policy requires the use of specific design features, when in close proximity to sensitive areas, to insure vegetation treatments do not have an adverse impact on non- target plants or animals. Treatments include the following methods: herbicide, manual, mechanical, biological, prescribed burning, and seeding, or any combination of treatment methods. See **Access and Equipment Maintenance Activity Types** for work activities pertinent for many of the following control methods.

**Ground Based and Aerial Actions** - Ground based application may include the use of backpack sprayers or vehicle-mounted or ATV sprayers (boom or spot gun) to treat noxious weed infestations. Aerial applications require the use of helicopters or fixed wing aircraft mounted with sprayers to treat noxious weed infestations.

### **ACTIVITY COMPONENTS AND WORK ELEMENTS**

**Biological Control** - Biological methods require the use of living organisms to selectively suppress, inhibit, or control herbaceous and woody vegetation. This method requires the proper management of plant-eating organisms and precludes the use of mechanical devices, chemical treatments, or burning of undesired vegetation. Biological weed control activities typically include release of parasitic and "host specific" insects to target weeds. Presently, insects are the primary biological control agent in use. Mites, nematodes, and pathogens are used occasionally. Treatments do not eradicate the target species but rather reduce target plant densities and competition with desired plant species for space, water and nutrients. Bio-control agents are typically used where the target weed has dominated the plant community across large areas.

*Collection and Release of Insects or Other Biological Controls* – Biological control activities include collection of beetles/insects, development of colonies for collection, transplanting parasitic beetles/insects, and supplemental stocking of populations. In most situations, a complex of biological control agents is needed to reduce weed density to a desirable level. For example, a mixture of five or more biological control agents may be needed to attack flower or seed heads, foliage, stems, crowns and roots all at the same time or during the plant's life cycle. Typically 15 to 20 years are needed to bring about an economic control level.

*Monitoring by Sweep Netting* - Involves inventory and monitoring of released bio-control agents to determine treatment success. Repeat visits may need to be made several times a season, and over a series of years.

*Competitive Seeding* - Noxious weeds commonly invade areas with disturbed or exposed soil or areas where native plants cannot compete with aggressive exotic plants. Consequently, after control of weeds, it is beneficial to establish native/desirable plants to compete with noxious weeds, restrict or prevent additional infestations, and help prevent soil erosion and further soil nutrient loss. Treatments may require ground and/or aerial application of seeds and fertilizers.

*Transport of Bio-control Agents by Vehicle* – Bio-control agents are transported in containers that safely enclose the agent until release.

**Cultural Control** – Cultural control treatments require management changes associated with prevention, livestock or wildlife manipulation, competitive plantings, and a change of public land use.

*Provide Shade* - Shade (i.e. shade cards or mulch) may be necessary to protect seeds and seedlings from high solar rays. See the **Reforestation Activity Type** for additional information.

*Fertilize* – Fertilizer application by *aerial or ground* method depending on the sites locations and treatment objectives. See the Insect Suppression Activity Type for activity components and work elements that describe fertilizer applications.

*Injection/Cut Stump* – Herbicides may be injected into stumps, using a hatchet injector or other type of instrument to inhibit re-sprouting.

*Chaining* – See the **Reforestation Activity Type** for implementation procedures associated with chaining.

*Grubbing* – See the **Reforestation Activity Type** for implementation procedures associated with grubbing.

See the **Prescribed Fire Activity Type** for activity components and work elements needed to prepare a site for planting using fire. Fire removes the woody debris and herbaceous litter that interferes with seedbed preparation. The effectiveness of using fire to remove debris varies with environmental conditions and the amount and distribution of fuel.

*Use Grazing to Control Weeds, Fencing, or Herding* – Domestic animals such as sheep or goats can be a valuable control method at reduced costs. The following considerations will be made before using livestock or herding: 1) size of infestation, 2) plant species, 3) timing of consumption for best control, 4) availability of water sources for stock, 5) stock management to insure beneficial effects, (e.g., when stock presence does not encourage spread of noxious weeds into non-infested areas). Some combinations of livestock or other bio-control agents such as insect may be the most effective. This activity occurs outside of a normal annual operating plan.

*Plant Native Vegetation* – Planting native vegetation in areas following fire will help prevent invasion and spread of noxious weeds. In areas where a good establishment of native species exists prior to fire, there is a high probability that natives would re-establish and occupy the site. In certain habitats, native species lower the frequency, intensity, and occurrence of wildland fire. See the **Watershed Restoration Activity Type** for activity components and work elements used to implement these procedures.

*On and Off Road Vehicle Use* – See the **Access and Equipment Maintenance Activity Type** for activity components and work elements needed to manage these activities.

*Mulch – By Hand or Machine* –Applying mulch helps prevent soil erosion, retain soil moisture, and protect seeds and seedlings from extreme temperature changes, wind, or damage from trampling. Mulch can be applied by manual or mechanical means depending on the need. Mulch may be applied using mulch mats, shovels, and rakes.

**Herbicide Control** - The herbicide application method and selected technique depends on a number of variables such as treatment objective (contain versus eradicate), accessibility, topography, and size of treatment area, characteristics of target plant and desired vegetation, location of sensitive areas in immediate vicinity, anticipated costs and equipment limitations, and meteorological and vegetative conditions at time of treatment.

Applications are scheduled and designed to minimize potential impacts to non-target plants and animals, while remaining consistent with vegetation treatment program objectives. Application rates depend on the presence of the target species, condition of non-target vegetation, soil type, depth to the water table, distance to open water sources, riparian areas, special status plants, and requirements of the herbicide label. See the **Insect Suppression Activity Type** for additional chemical application descriptions.

*Hand Crank Granular Spreader* – Some herbicides are applied in solid form and are placed on the soil surface to be absorbed by plant roots.

*Liquid Application* - Carriers are gases, solids, or liquids used to dilute or suspend herbicides during application and allow for proper herbicide placement. Liquid carriers include water, liquid fertilizers, diesel, and other similar low-viscosity oils. Water is the most widely used carrier because it is available, cheap, and most herbicides are formulated to be applied with water.



Spray solution additives, adjuvant, are mixed with herbicide solution to improve spray mixture performance. Adjuvant can either enhance activity of a herbicide's active ingredient or offset any problems associated with spray application such as adverse water quality or wind. Adjuvant may contain surfactants, antifoaming agents, crop oil or crop oil concentrates, drift retardants, compatibility agents (mixing two or more herbicides in a common solution), and spray buffers (change the spray solution PH).

*Spray from ATV* – A sprayer attached to an ATV allows for treatments of patches of weeds on hillsides, or other areas not easily accessible by road.

*Back Pack Sprayer with Spray Wand* – A pressurized container with an agitation device carried with backpacking equipment, allows the operator to target specific or individual plants.

*Aerial Application by Fixed Wing or Helicopter* – Aerial application of herbicides from a helicopter or fixed wing aircraft do not disturb soil or protective organic layers and are not limited by inaccessibility or rugged terrain. Applications allow for treatment of large areas quickly with a smaller workforce, however, drift management and off-site effects may be more difficult to manage and predict.

*Spray from Truck Mounted Boom or Spray* – Truck mounted mechanical spray equipment is primarily limited to treatment of roadsides and flat areas that are accessible. This allows large area coverage, and is faster and less expensive than manual or hand applications.

*Hand Controlled Wand with Soaked Wick* – Technique allows user to target individual unwanted plants reducing risk to non-target organisms and other resources.

**Manual Control** - Manually treating noxious weeds may disturb soil surfaces and can be labor intensive and costly when compared to herbicide applications. Manual treatments are typically used to treat selected plants, small infestations, and in sensitive areas to avoid adverse effects to non-target species or water quality.

*Hand Clip Seed Heads or Pull Weeds* - Crews may use power or hand tools to cut, clear or prune vegetation; pull, grub, or dig out plant root systems to prevent subsequent sprouting and re-growth; scalp vegetation at ground level or remove competing plants around desired vegetation; or place mulch around desired vegetation to limit the growth of competing vegetation. All noxious weed disposals will be in accord with proper disposal methods. Noxious weeds with developed flowers are generally bagged and burned. This method is most effective on new infestations of annual, biennial, or simple perennial exotic plant species.

Handsaws, axes, shovel, rakes, machetes, grubbing hoes, mattocks, brush hooks, and hand clippers may all be used to treat weeds. Axes, shovels, grubbing hoes, and mattocks are also used to dig up and cut below the surface to remove the main root of plants. This is especially effective on plants that quickly re-sprout in response cutting and clearing.

**Mechanical Control/Restoration** - Activities include the use of wheel tractors, crawler-type tractors, or specially designed vehicles with attached implements for mechanical vegetation

treatments (e.g., plows, harrows, rangeland drills and mowers). Choosing the appropriate treatment depends on the characteristics of undesired species present (for example, density, stem size, brittleness, and sprouting ability); the need for seedbed preparation and revegetation; topography and soil characteristics of the site (e.g., type, depth, amount and size of rocks, erosive conditions, and susceptibility to compaction). It also depends on the climatic conditions; and potential cost of improvement as compared to expected productivity. Activities typically occur on old agricultural areas, industrial sites, and roadsides.

*Weed Whackers* – This is a motorized brush cutter with a saw-like blade used to remove herbaceous or woody plant materials. This may be used in conjunction with other power tools to (such as a brush buster), to remove noxious weeds or clear dense areas of trees or brush preparing the area for replanting or reseeding. Slash busters may be used to mow down heavy slash or unwanted vegetation in densely vegetated areas.

*Plowing – transport of heavy equipment* – Tractors with attached discs (disking), chains (chaining) or other types of plows may be used to clear and de-root plants, furrow (plowing a strip) or contour a site, or used to completely remove vegetation (scarification) from an area. The transport of tractors and their associated implements may require the use of trucks with low bed trailers or other types hauling vehicles.

*Mowing of Weeds* – Tractors with mowing implements may be used to mow vegetation along roadsides, and in rangelands with dense shrubs or grasses. Although mowing may not remove roots, it helps eliminate undesired plant species by giving desired plants a competitive advantage. See **Habitat Restoration Activity Type** for more discussion of this work element.

*Drill Seeding* - On areas with moderate slopes, the use of rangeland drills attached to tractors, may be the most effective method reseed an area.

*Aerial Application of Seed* – Seed may be applied aurally using helicopters or fixed wing aircraft when appropriate. See the Insect Suppression Activity Type for additional descriptions activity components and work elements associated with aerial applications.

## **Weed Prevention**

*Wash Vehicles, Water Drafting* - Washing vehicles used to access and maneuver around treatment sites should occur before and after work is accomplished. Washing would occur at designated areas and may require water drafting from a nearby water source such as a pond, lake, stream, or spring. Water hauled in by truck is an alternative to using natural water sources.

## **Information**

*Education/Outreach* – Informational materials, seminars, and workshops may be provided to assist agency personnel and the public in understanding the effects of noxious weed invasion and spread on native plant communities. Providing information and education to assist with prevention, control, and eradication of noxious weeds is the primary objective of these efforts.

Federal land management agencies that conduct noxious weed treatments must closely coordinate with state agencies, county weed control programs, and other federal agencies. Herbicides used on federal lands must be registered by the U.S. Environmental Protection Agency.

## **References**

A Risk Assessment for Herbicide Use: A USDA Forest Service Publication of Forest Service Regions 1, 2, 3, 4, and 10, and the Bonneville Power Administration (1992). This has been prepared to address applicable risks of herbicides to human health and non-target species including wildlife and aquatic species.

Noxious Weeds Home Page at [www.fs.fed.us/r6/weeds](http://www.fs.fed.us/r6/weeds): A USFS Region 6 Natural Resource Home Page. This is an excellent resource with detailed information about noxious weeds, treatments, chemical uses, and the legal aspects treatments related to chemicals uses.